The Chinese University of Hong Kong

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LYU1403

Exhibition Navigation with iBeacon

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Abstract

iBeacon is an emerging technology for indoor locationing. One of its use case is for navigation in indoor areas, like museums and shopping malls. In this project, the possibility of such use case of iBeacon was explored. A deployable software system that delivers information to visitors has been developed. This report includes discussion on various existing beacon services and the technology concerned. To prove its feasibility, various experiments have been conducted on the use of iBeacon for indoor locationing under different beacon deployment methods. The design of the three parts of the developed software system: content management system, client app and deployment tool, are discussed in detail in the report.

Contents

1 Introduction

1.1 Background

With the advancement of technology, the accuracy of outdoor positioning and navigation systems has increased rapidly these years. For instance, the development of GPS is mature. According to the United States Government, the accuracy of civilian GPS is up to 7.8 metres and has a 95% confidence [1]. However, there are far fewer people developing indoor positioning and navigation systems and the pace of the development is far slower than GPS. We want to be one of the pioneers of developing indoor positioning systems, which have potential uses in marketing and exhibition navigation in near future.

After seven months of research on indoor positioning systems, we see the huge business opportunities of the system. Therefore, we have decided to continue on this topic and conduct a further exploration on it. This semester, we have improved the user experience of the Android mobile application and the added a lot of useful and new features to the beacon CMS. We hope that the new features can make exhibition navigation easier than ever. The ultimate goal of the project is to provide a full-featured solution on indoor navigation, from content management, deployment tool to user application.

1.2 Introduction to Bluetooth

Bluetooth can easily be found in many mobile phones, laptops and sensors nowadays. The ease of pairing devices and low battery consumption have made Bluetooth more and more popular. Bluetooth is currently regulated by Bluetooth Special Interest Group (SIG) and uses frequencies band between 2.4 GHz and 2.485 GHz. Bluetooth is claimed to have a maximum range of 60 metres; while in reality, the range might change due to different environment, connections nearby and obstacles in the area. To prevent interferences between different connections nearby, Bluetooth uses a frequency hopping spectrum which jumps from one frequency to another at 1 MHz or 2 MHz intervals, making the frequency spectrum contains 79 channels or 40 channels respectively.

Up to today, there are already four versions of Bluetooth - from version 1.0 to 4.0, specified by the SIG. Bluetooth Low Energy (BLE), which is being used in our research project, is specified in version 4.0, released as a subset of Bluetooth. In 2011, the SIG used "Bluetooth Smart" as the marketing name for this new specification. In the following sections, Bluetooth Low Energy and Bluetooth Smart are considered the same technology. BLE uses even less power than previous versions of Bluetooth. Because of its low power consumption, a BLE chip can work by using a silver oxide button cell which is commonly found in calculators. Furthermore, one battery is enough for the chip to work for about 1 year without replacement. In December 2013, the SIG updated their specification from version 4.0 to 4.1. New features of Bluetooth version 4.1 include dual mode and limited discovery mode.

1.3 What is an indoor exhibition navigation system?

An indoor exhibition navigation system provides relevant information on exhibits in an exhibition scenario. It can also be configured to provide customized marketing information to customers, instead of massive advertisement without a target.

An indoor exhibition navigation system involves two major parts. The first part is indoor positioning, which determines the users' context and the relevant information to be shown. In our project, BLE and mobile devices are chosen to fulfill this task.

The second part is data storage, which describes the details of the exhibition and provides the information. An online database backend, from which the mobile device retrieves data, will be deployed for this task.

The requirement of an indoor exhibition navigation system will be further discussed in the section "Requirement Analysis".

1.4 Why Bluetooth Low Energy (BLE)?

GPS does not work very well indoors; while WiFi is not designed to provide information on navigation; the range of NFC too short for accurate position determination; the range of cell towers is too large that it covers up to 20 miles [2]; and RFID requires an antenna and a special reader that is not readily available on consumer mobile devices [3]. Therefore, a better alternative solution must be found.

Bluetooth Low Energy (BLE) is built for information systems that works well both indoors and outdoors and compatible to the major mobile platforms and devices today. Furthermore, BLE uses little energy, which implies that maintenance needs not be done very frequently. Therefore, we have decided to use BLE to power our indoor navigation system.

2 Objective

Through this project, we hope to:

- provide a reliable indoor navigation system using iBeacons and magnetic sensors on the phone

- provide a quick and easy way to deploy beacons that suits the needs of reality

- provide statistics to exhibition owners to facilitate marketing

- receive feedback from the public at the ICT Expo 2015

- contribute to the open source project OpenLobster

3 Requirement Analysis

The deployment of beacons for exhibition navigation systems is still not very popular today. There are not many companies providing easy beacon deployment services. However, we can still look into some examples and hope to provide some inspirations to our project.

3.1 Services

3.1.1 Kontakt.io

Kontakt.io provides an API and SDK on the cloud along with beacons setup and management services [4]. It also has a global CDN to deliver fast data queries to customers. In contrast to ordinary beacons, the company claims their beacons are smart that they are suitable for a wide range of applications. Their beacons have a 32- bit ARM CPU, 256KB of RAM and a Bluetooth chip, which supports a range up to 70 meters. Even more, Kontakt.io beacons are IP-57 verified - the casing protects the component from water splash and dust. However, the application developed on these beacons can only invoke a web page activity when they are detected - which limits the extensibility of the application. Even worse, we have to buy the subscription plan if we want to use their beacons, which greatly increases the cost of development and maintenance.

3.1.2 IndoorAtlas

IndoorAtlas, a startup based in Finland, claims to provide a far more accurate solution for indoor positioning systems [5]. The technology that the company uses is the detection of the disturbances of the Earth's magnetic field by the architecture. This method has been verified by a journal article, "Global Indoor Self-localization Based on the Ambient Magnetic Field" [6], published in October 2009 by one of the founders of the company.

IndoorAltas emphasizes that no additional hardware is required for setting up the location navigation system, as the technology only uses the magnetometer, which can be found in most smartphones today. Furthermore, there is no cost in using the SDK, 9 API and CMS provided by the company. Only large-scale deployment schemes require a fee to use their service. The online CMS requires no codes to operate - only dragging and dropping of indoor layout map and entering of some basic information are needed. Yet, this method for location estimation is unusable in outdoor exhibition navigations as the interruption of Earth's magnetic field by outdoor objects are weak, thus, the recognition of patterns of disturbances of fields would be more difficult.

3.1.3 Proximity Kit by Radius Networks

Though Proximity Kit does not bundle beacons with their subscription plans, the company sells AltBeacon standard beacons (another product by Radius Networks) and peripherals [7]. They sell subscription plans that provide an online CMS and analytics. Moreover, like Kontakt.io, Proximity Kit has its own SDK. The company states that their advantage over other competitors is that hard-coding of coordinates of the beacons is no longer required. However, the estimation of location by Proximity Kit on Android devices is not accurate as there is a bug in averaging the signal strengths in the library that they used [8]. Moreover, different Android phone models have drastically different Bluetooth signal strength response. Yet, the library only has the calibration data of a few models.

3.1.4 Open Lobster SDK

Open Lobster SDK is the project that we are currently working on. Open Lobster is an acronym of "Open-source Location-based Services Technology Engine with Recommendation" and is developed by the Department of Computer Science and Engineering of the Chinese University of Hong Kong. The SDK aims to provide an easy-to-use interface for developers to build indoor-location-based applications in a very short period of time. Apart from the mobile frameworks that it provides, the Open Lobster SDK also brings a RESTFUL API for quick query and modification of exhibition items.

3.2 Case studies

3.2.1 City Gallery

The City Gallery, which is formerly called the Hong Kong Planning and Infrastructure Exhibition Gallery and located at City Hall, Central, makes use of indoor exhibition location technology to implement audio guided tours [9]. The Gallery provides applications for iOS and Android for the exhibition with almost the same feature sets. Features like exhibition overview, tour guide and latest news are included in the application [10] [11]. Figure 1 to 3 show the UI of the City Gallery application.

The navigation system there makes use of ultrasound and WiFi, instead of Bluetooth, to estimate the position of the user. The system is able to identify the exhibition area in which the user is located at a high accuracy. The audio track corresponding to the area will be played accordingly. Though the technologies involved in the Gallery are not in the scope of our project, the content and user interface of the mobile application provide good examples for us to develop our application.
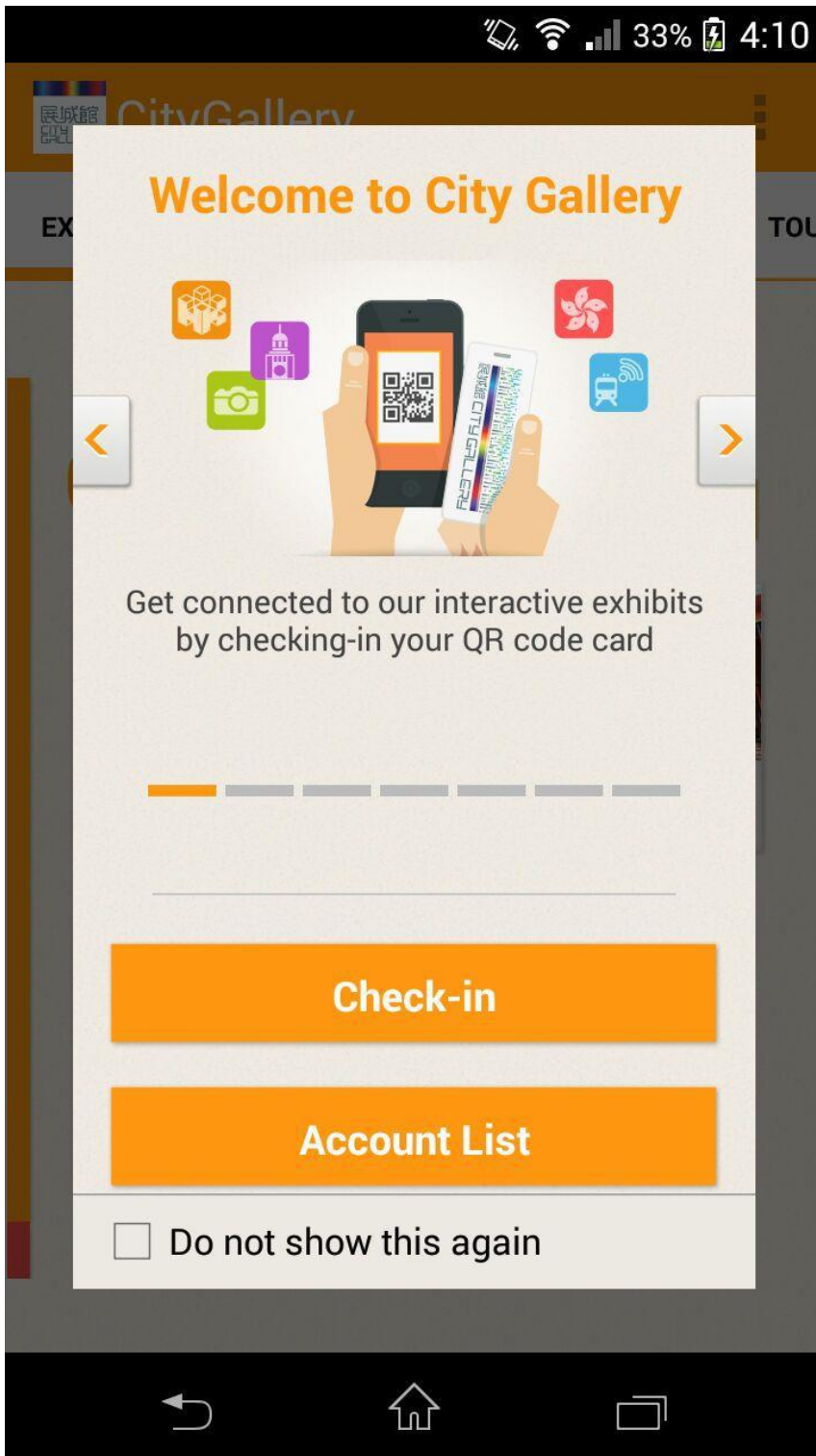
Figure 1 Welcome screen of City Gallery's application

Figure 2 Floor plan and audio tour
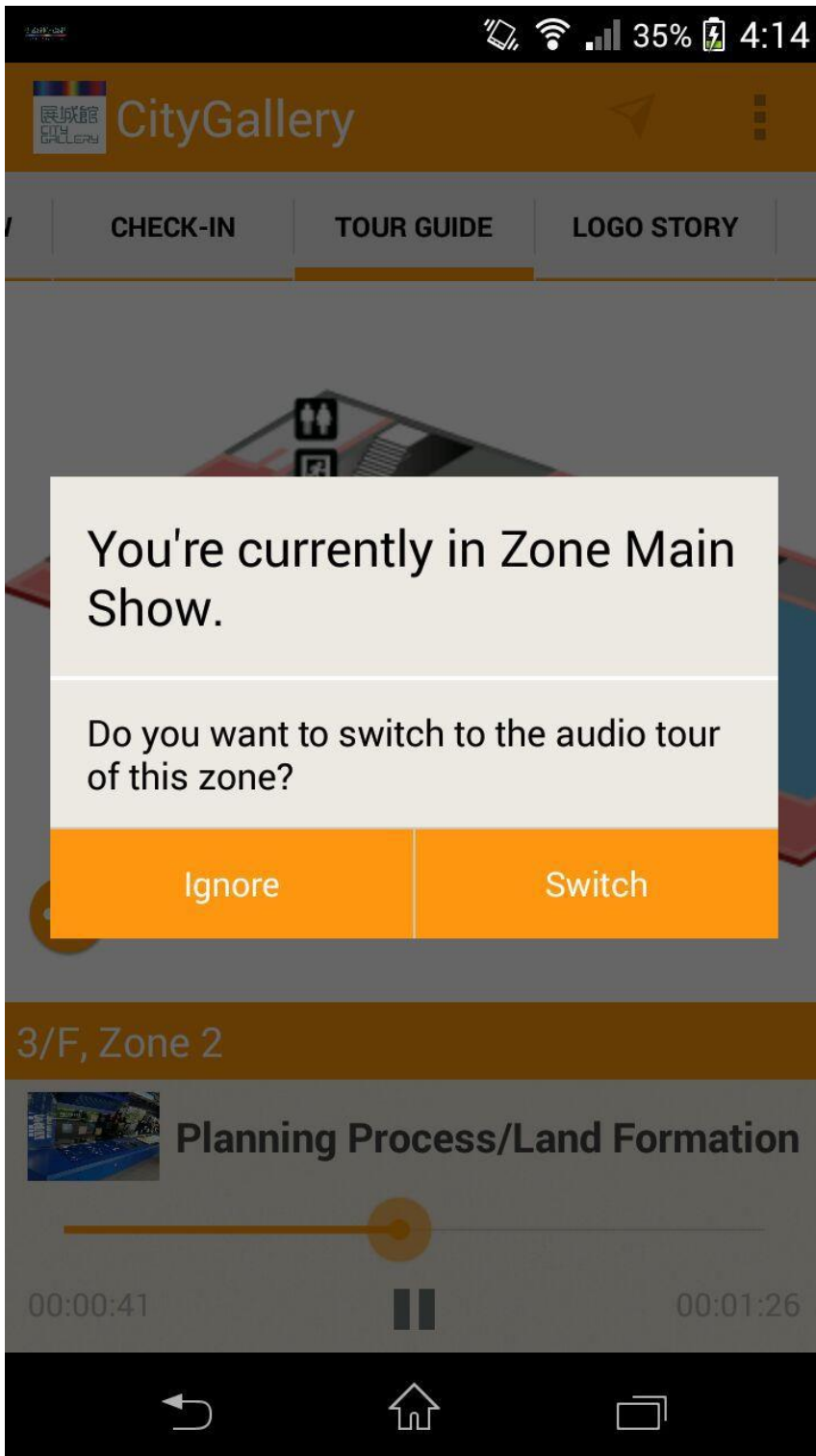
Figure 3 Automatic location detection

3.2.2 Macy's

Macy's owns a big chain of department stores in the United States. Two years ago in November 2012, the department store giant had already deployed Bluetooth beacons in its biggest store in New York City and updated its iOS application to test out the new indoor navigation technology [12]. The company partnered with Meridian [13], now owned by Aruba Networks, a WiFi solutions company, to roll out the beacons installation and application deployment project. The iOS application brings in-store turn-by-turn navigation and product information to shoppers [14]. Recently, an Android application by Macy's without turn-by-turn navigation is also released on Google Play [15]. However, both Meridian and Macy's did not provide further information on the technical details on the mobile application. It is believed that Macy's uses BLE technology to bring customers to the products they want.

3.2.3 LINE Maps for Indoor

A new indoor mobile map application, which targets shopping malls and department stores, was released in November 2014 by LINE. This application provides turn-by-turn navigation for multi-storey buildings, shops and facilities searching, and search results filtering according to shop categories [16] [17]. It also provides useful information like locations of washrooms, AEDs, entrances and exits, directions to the nearest train stations and shopping mall opening hours. Its pannable 3-dimensional map layout with short text descriptions makes following the route easier than plain text instructions. Figure 4 – 11 illustrate the UI of LINE Maps.

However, this new application is quite unstable and have unexpectedly quit for thrice during our test. The technology used for indoor location determination by it is WiFi and we doubt the accuracy of the estimated location. LINE Maps for Indoor is currently available on Android for a few malls and department stores in Tokyo and Kanagawa only. We hope that this promising application can be used in popular locations all around the world to promote the use of indoor exhibition navigation.
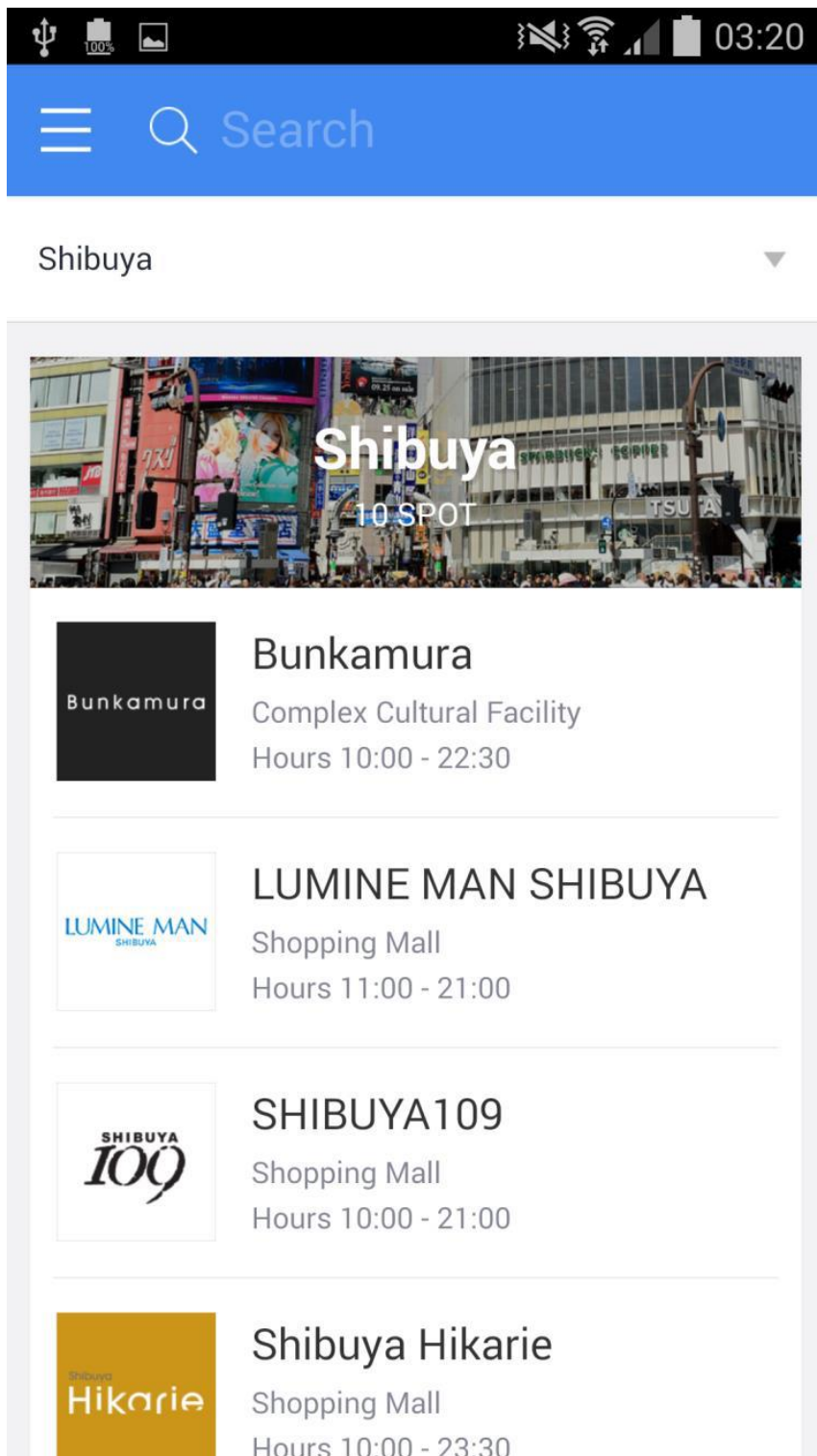
Figure 4 List of malls that provide indoor maps

Figure 5 Indoor map showing shop names
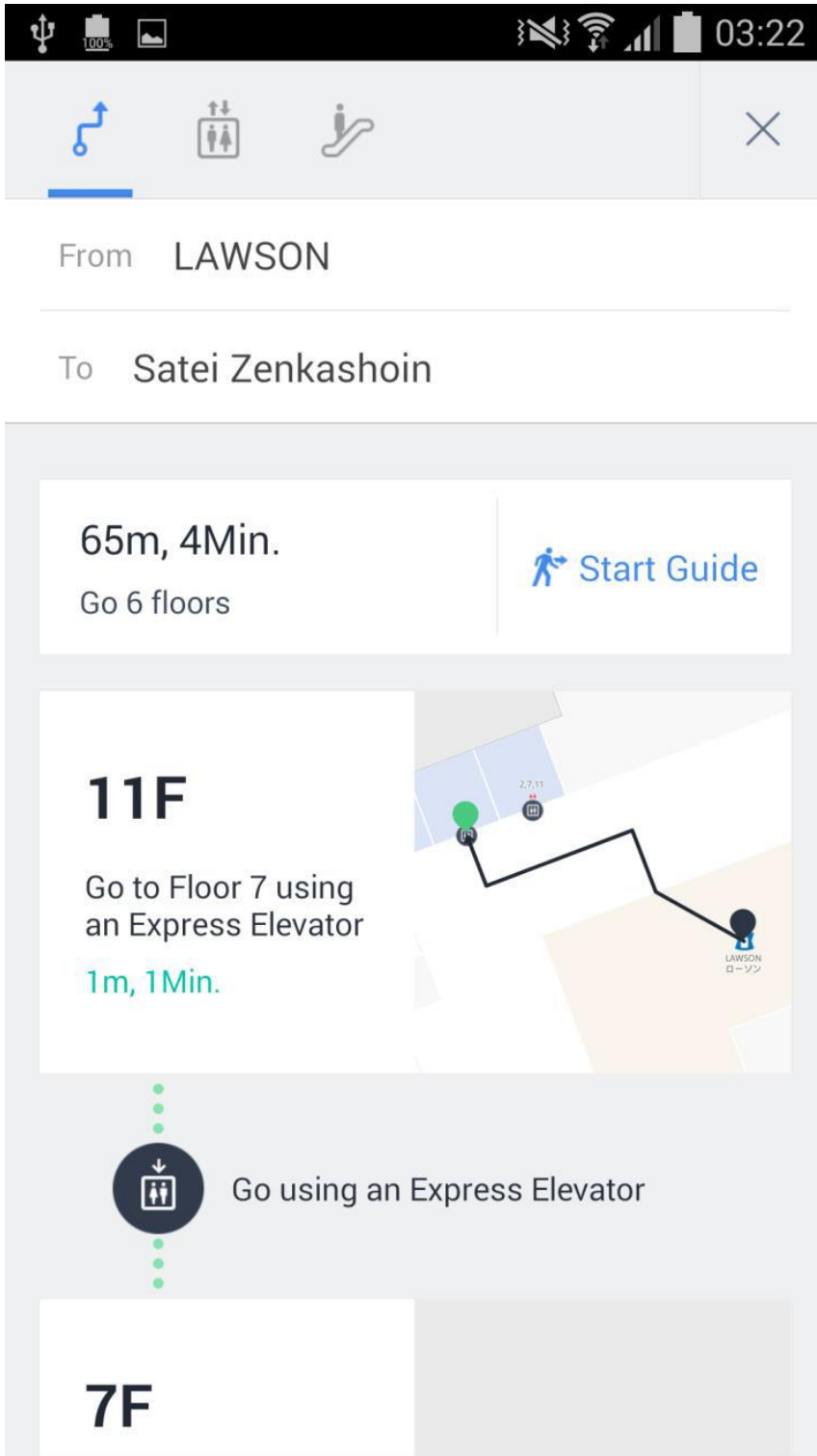
Figure 6 Route overview
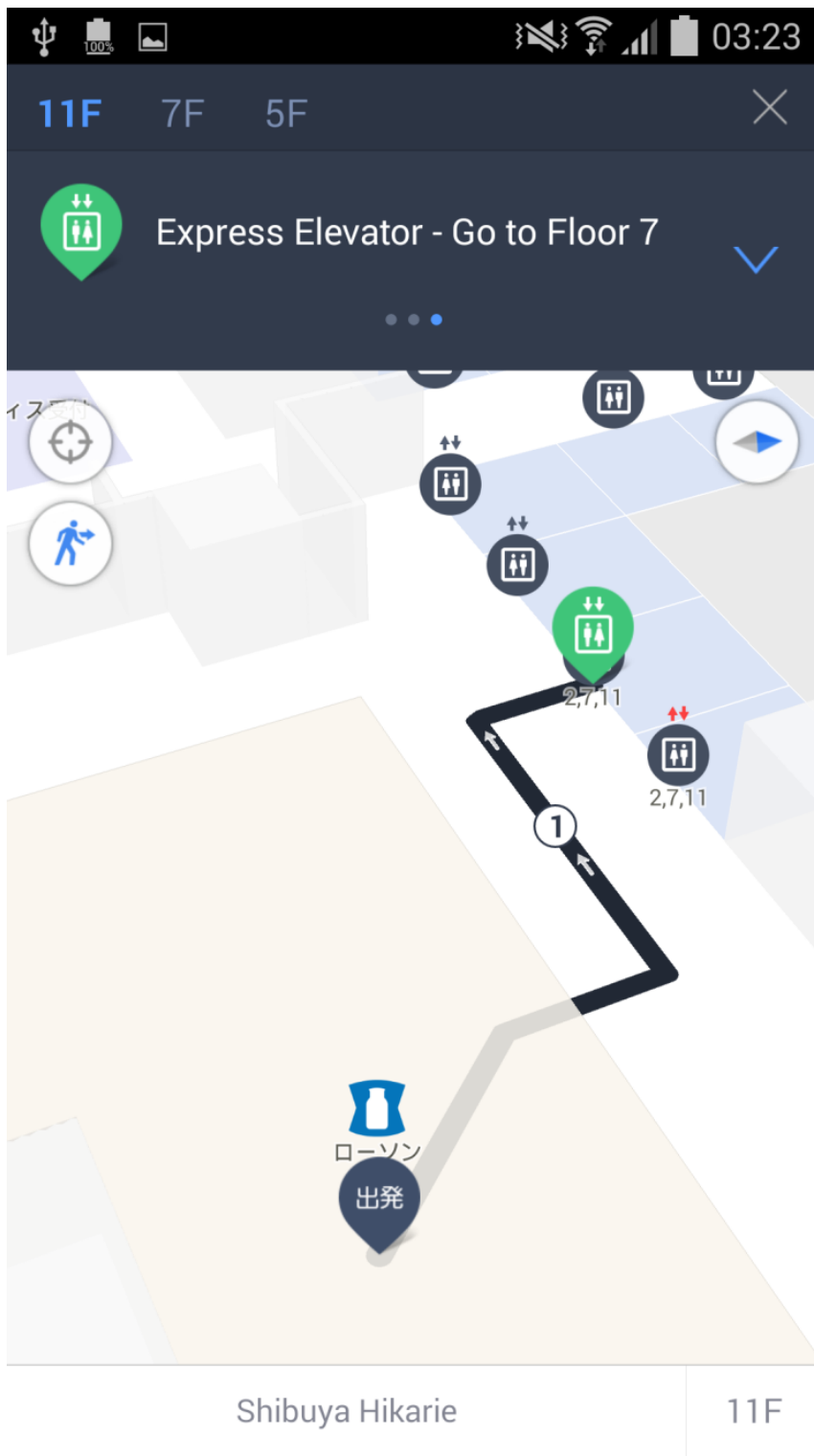
Figure 7 3D Indoor turn-by-turn navigation

Figure 8 3D turn-by-turn navigation showing destination
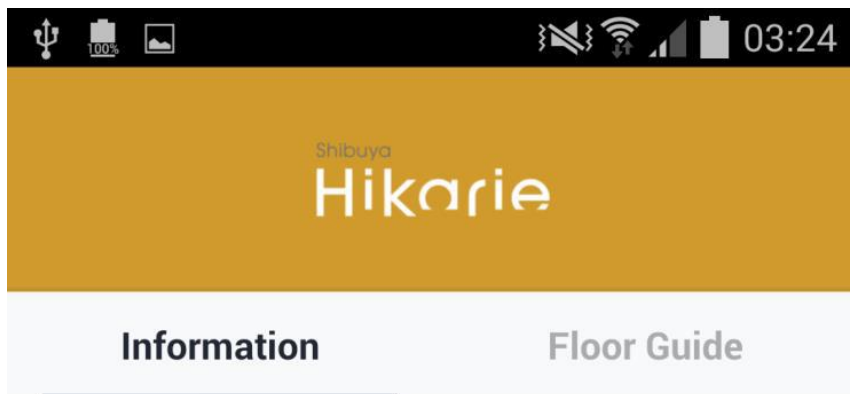
Shibuya Hikarie

Shibuya, Shibuya-ku, Tokyo
2-21-1

Phone Number

03-5468-5892

Hours

ShinQs
Every day 10:00 ~ 23:30

Figure 9 Mall information
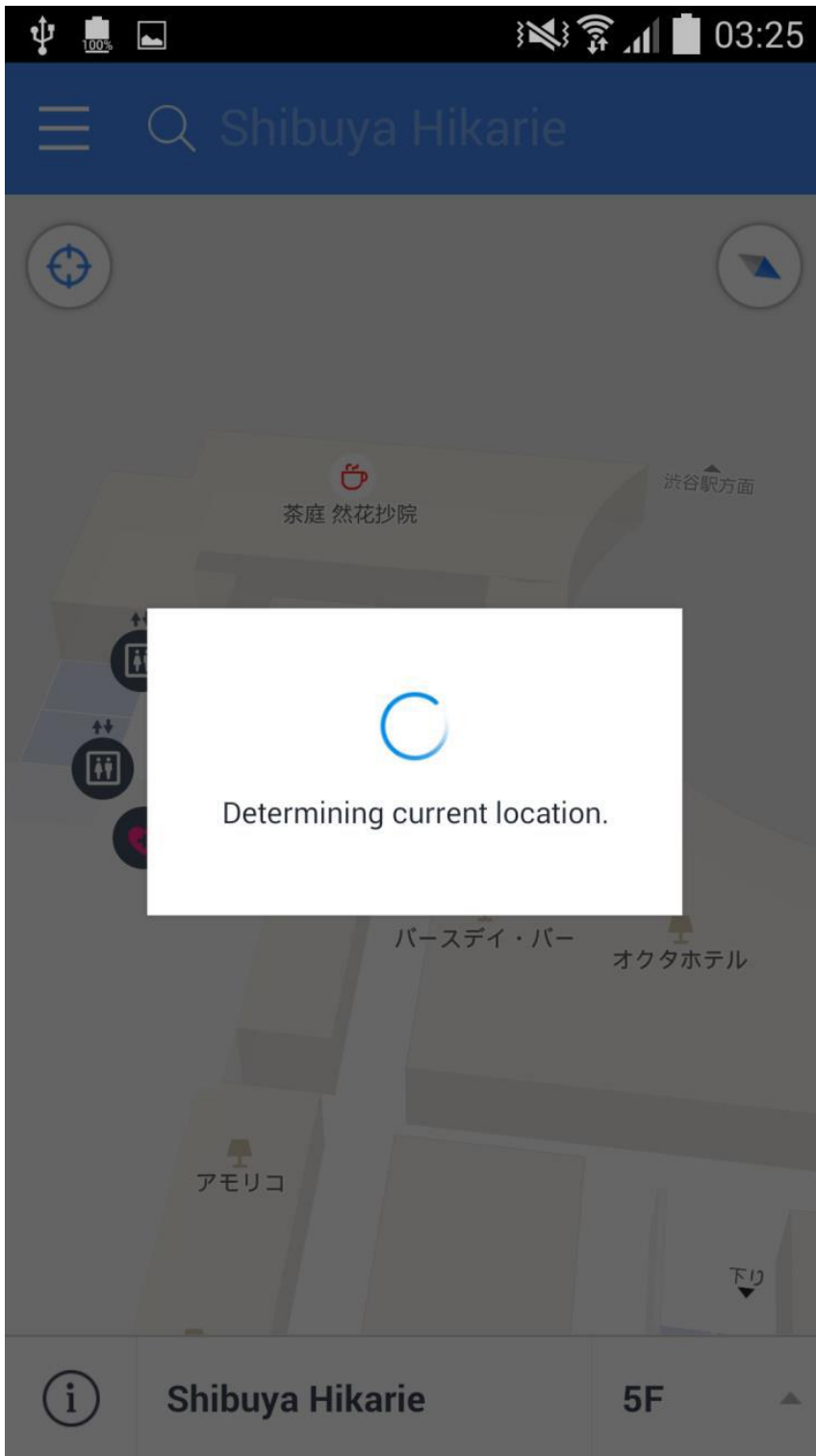
Figure 10 Automatic location determination

Category

Exit & Entrance (7)

Toilet (36)

Smoking Area (4)

Facility (267) ⌄

Convenience Store (1)

Cafe, Dessert (13) ⌄

Food (49) ⌄

Fashion (21)

Fashion Accessary (33)

Shopping (184) ⌄

Repair (1)

Figure 11 Shops sorted according to categories

Table 1 summarizes the exhibition navigation systems and services mentioned above.

Features	IndoorAltas	City Gallery	Macy's	LINE Maps for Indoor
Technology	Magnetic field	WiFi and ultrasound	Bluetooth Low Energy	WiFi
Calibration	Required	-	-	-
Ease of use	Difficult	Easy	Easy	Very easy
Provides custom information	Information can be customized	Customized information	Customized information	Not much, provided by shopping malls in Kanto, Japan only
Other relevant information	In-store advertisements , needs to be set up manually	Exhibits information	In-store advertisements	Toilets, AEDs, entrances and exits and train and bus stations
Accuracy of location determination	Very high	High	Low, according to user reviews	Rough estimation
Turn-by-turn navigation	Yes, needs to be set up manually	No	Yes	Yes, supports multi-storey buildings and method of travelling (by escalators or elevators)
Cost of deployment	Second lowest among four	High, tailor-made	High, tailor-made	Free to a very small fee

Table 1 Summary of various indoor navigation systems

Apart from IndoorAltas, City Gallery's, Macys' and LINE's application cannot be customized as they are all tailor-made for specific customers, making editing information in the application difficult. Only IndoorAtlas' service requires a set up and calibration for detection of the magnetic field. All of the applications can provide relevant information, for example, advertisements and directions to exits, to customers. Out of our expectation, Macy's application performed the worst among four navigation systems in indoor location determination. According to reviews on App Store, the navigation of Macy's application is disastrous. IndoorAtlas' service performed surprisingly well as we can consider the earth's magnetic field should be constant at all times and ultrasound used by City Gallery should be less easy to be diffracted. As expected, LINE's map mobile application can only provide a rough estimation of a user location as it uses the signal strength of WiFi only. Except City Gallery's application, all the other three provide turn-by-turn navigation. However, the navigation provided by IndoorAtlas has to be manually set up. LINE Maps for Indoor provides excellent navigation as the application supports multi-storey buildings and multiple buildings. It also provides the best route or customized routes to users. Finally, the cost for deployment and maintenance is the lowest if we use LINE's application for navigation. However, a small fee might have to be paid to LINE for allowing the application to show the information of the mall or exhibition. As City Gallery's and Macys' application is tailor-made for the exhibitions and stores, we can expect that the cost for deployment is very high.

From the comparison of some of the popular exhibition navigation systems and services above, LINE Maps seems to have more advantages than the other three and we suggest that we can refer to the successful results of LINE's application as our direction of application or API development.

3.3 Project Scope

From the above analysis, we have determined that our project should include numerous parts. A client-side mobile application will be developed for indoor navigation. It will be responsible for scanning beacons, determining user's location and display of relevant information. All information will be retrieved from the server. The application should be able to distinguish different users for personalized social features and marketing.

On the server side, a database will be deployed. The database will store all information related to the deployed beacons, the exhibition layout, and the exhibits information and user analytics. On top of the database, a content management system (CMS) will be developed. The CMS enables easy modification to the database and eliminates the need to update the app due to changes in exhibition content.

Apart from these software components, two design questions will have to be solved. The first one is how an indoor environment layout can be represented in the database. The second one is how the beacons should be deployed.

After our experiment and investigation on indoor navigation systems in the previous semester, we have decided to install one beacon for one or two exhibit(s) places close together. This is because installing too many beacons in a small area causes interferences of waves while installing too few might cause accuracy problems.

For the client side, the deployment scheme should be the same as the previous application. Yet, we have rewritten the mobile application to improve user experiences. Design of the mobile application will be discussed in the later parts of this document.

Furthermore, we have further improved our easy-to-use API and revamped the user interface of the online CMS. The CMS now provides even more functions to exhibitors – one-click beacon location deployment, adding multimedia content from the Internet, including embedding videos provided by YouTube and HTML5 audio or video. Exhibitors can also view the visitor count and rating of each exhibit to refine marketing strategies according to the popularity of each section of exhibition.

The flow of exhibition navigation involves the following four steps:

1. When a user launches the app, the application scans for beacons nearby. Using the ID of the detected beacon, the application can identify the exhibition the user is visiting.

2. The application downloads information related to the exhibition from the server. This includes a list of beacon-to-exhibit translations, exhibition titles and floor plan. The exhibition introduction page is shown.

3. The phone continuously scans for beacons in the area that the user is located and updates the phone heading azimuth. The scan is done in background, no user interference is required. The beacon ID and magnetic sensor values are matched against the beacon-to-exhibit translation list. If a match is found, a dialog box is popped up to suggest users to proceed.

4. When the user taps the dialog box, the information of the relevant exhibit will be displayed. The page is displayed to the user by using WebView, which allows dynamic content to be updated frequently and efficiently without adding loads of extra codes to the mobile application. Multimedia content, including audio, video and Youtube embed, will be supported.

4 Technology

The following sections further analyses the choices of technology we have made, namely BLE and the Android mobile platform.

4.1 Bluetooth Low Energy

Bluetooth Low Energy is a subset of traditional Bluetooth. However, it uses far less energy than conventional Bluetooth. BLE can be used to transmit small packages within mobile devices, sensors and wearable devices.

4.1.1 Generic Attribute Profile

The Generic Attribute Profile (GATT) makes definitions on how Bluetooth devices communicate with each other [18]. There are four GATT profiles defined in the Bluetooth specification, but we will only cover two of them, which Android supports as of November 2014, peripheral and central. Similar to onion routing, GATT profiles nest information inside themselves. The outermost layer is usually called Service, indicating the name and type of function that the Bluetooth device provides. The next layer usually nests a number of Characteristics – the detailed features that the devices give. Under Characteristics, there are numerous name-value pairs defining the custom preferences of each character. For instance, some custom preferences are the properties, value and descriptors of the beacon. Figure 12 illustrates the profile hierarchy.

As mentioned above, the two profiles that Android supports by now are Central and Peripheral. The Bluetooth network adopts a star topology approach to connect devices nearby (to be discussed a subsequent section). The beacon to be scanned holds a Peripheral profile, also called the GATT server, while the phone or tablet looking for beacons hold a Central profile, also known as the GATT client.

Profiles do not exist in peripherals, to be exact, peripherals only hold a list of services defined by manufacturers. For example, the Heart Rate Profile, only mashes up the Heart Rate Service with Device Information Service. The complete list of profiles can be found on Bluetooth's official website [19].

4.1.2 Speed

Though Bluetooth Low Energy has a maximum data transfer speed of 1 Mbps, it is not designed to transfer larger amount of data. The technology supports only small packets – from 8 octets up to 27 octets only.

4.1.3 Frequency Band

To reduce interferences with other Bluetooth devices nearby, Bluetooth 'hops' a frequency of 2MHz per step, while 1MHz for Bluetooth versions below 4.0, using Adaptive Frequency-Hopping. From 2.402GHz to 2.480GHz, Bluetooth 4.0 provides 40 channels and the hopping frequency is up to 1600Hz [20] [21].

4.1.4 Setup

Bluetooth Low Energy has a minimum setup time of 3 ms, which is 2 ms more than NFC for connection initialization.

4.1.5 Range

The maximum range for Bluetooth devices is up to 100 metres. However, we place Bluetooth beacons far closer than this maximum range, for example, 2 to 10 metres, for more accurate position estimation.

4.1.6 Security

Bluetooth chips encrypt data using AES-128 before sending it. The encryption mode uses CCM for authentication before encryption to provide extra security. However, we do not have to take care of the encryption process for now because the data we are sending are not highly sensitive – publicly available information like UUID, major and minor.

4.1.7 Topology

Bluetooth Low Energy adopts a star topology for connections. This is possible because each packet for each connected node uses a 32-bit address, which allows a large number of Bluetooth devices communication with the central hub. Again, this is out of our scope of our project for now because there are far more slots for connections than we need.

4.1.8 Power consumption

The new Bluetooth specification used in BLE uses less power than conventional Bluetooth – the official website states that one coin battery (for example silver oxide battery used in watches and calculators) can be used for at least one year. The type of battery used, and thus the lifetime, still depends on the model of beacon.

4.1.9 Bluetooth stack

Apart from the conventional Bluetooth stack used in versions prior to version 4.0, BLE introduces a new low energy stack which allows manufacturers and developers explore new functions using BLE.

4.1.10   Services and Characteristics

Services and Characteristics are both defined in the UUID, Universally Unique

Identifier. UUID can have a length of 16-bit or another custom length, as specified by

the manufacturer. Services and Characteristics are just substrings of UUID. For

example, the Heart Rate Service is assigned with the UUID with substring of 0x180D;

Glucose Service with 0x1808. Through reading these values of services and

characteristics in UUID, client can understand what the Bluetooth device does.

To be concise, characteristics are abstract classes to be implemented in the beacon

hardware and services are sets of characteristic(s).

4.1.11   Descriptors

To allow debugging easier, we set short texts, as known as descriptors, to describe

what the characteristic(s) do(es). These descriptors, like comments within codes, are

optional.

4.1.12   Central and Peripheral Profiles

To connect two devices using BLE, we need one device taking up the central profile

and another one taking the peripheral profile. Both central and both peripheral will not

work.

To be concise, the central one is the scanner and the peripheral one is the

broadcaster.

4.1.13 GATT servers and clients

After two devices are connected, they have to choose a role to take up – either a server or client. It is crucial to understand that mobile devices are not always necessarily to be GATT clients and beacons are not always GATT servers – it depends on their communication. The example in the same section above states that the Android device is the client and the beacons are the server. This is true when the beacons are sending their metadata, for example, UUID, major and minor, to the phone. In another case, an Android phone can also act as a server – the phone sends alerts to a BLE smartwatch.

To be concise, the functions of BLE devices do not limit them to be servers or clients – their connections between them determine which device takes up the server and client role.

4.1.14 Cost

Cost is one of the major obstacles that slows down the development of indoor positioning by Bluetooth beacons. As of November 2014, one beacon costs at least HKD$40 (¥30) on Taobao [22]. Comparing to NFC tags, which costs only for one dollar, Bluetooth beacons are far more expensive. It is estimated that the deployment of indoor navigation system in a museum uses at least hundreds of beacons. Not to mention the application development, testing and maintenance cost, the high cost of installation of indoor exhibition navigation systems scares people away from it.
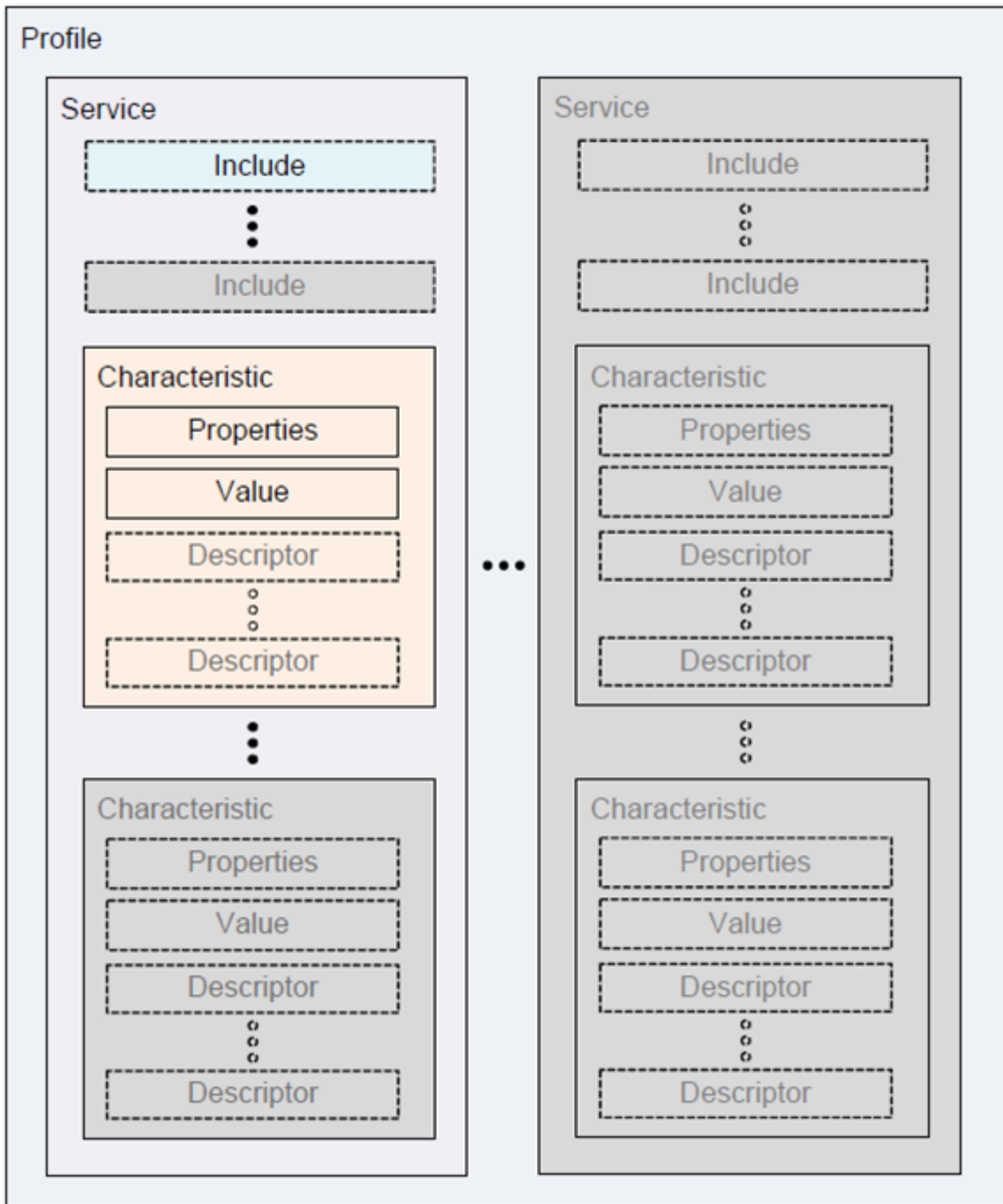
Figure 12 The profile hierarchy

4.2 iBeacon

iBeacon is a subset of Bluetooth Low Energy specified by Apple. It works similarly as other ordinary Bluetooth beacons – both emit radio waves and can be connected by mobile phones. However, there are some slight differences between iBeacons and other Bluetooth beacons. For example, their advertising packets (data that the beacons emit) differentiate them from each other.

4.2.1 Modes

The most simple and popular mode that iBeacons use is advertising. The beacons simply broadcast signals to the environment nearby. We call these signals as advertisement. We can use iOS devices running iOS version 7.0 or above to spoof a beacon that runs the advertisement mode. However, in Android, this feature is not available until version 5.0, Lollipop.

4.2.2 Editing an iBeacon

App Store does not allow applications to edit iBeacon details using wildcard UUID (usually specified by manufacturer; one manufacturer, one UUID). In other words, you can only modify the data of an iBeacon using the official application that is made by the manufacturer; you can write your own app to modify the beacon, upload it to GitHub, or your blog, but your application cannot be sold on Apple's App Store.

4.2.3 Advertising packet

Advertising packet refers to part of the data that is broadcast by a beacon. As mentioned in Introduction of this section, iBeacon has a slightly different specification from other BLE devices, as defined by Apple. The content of the advertising packet of an iBeacon is 28 bytes long. The fields are listed table 2.

Different beacon manufacturers may use different number of bytes in a beacon signal

to send data, for example, a hyperlink in a beacon signal. To let our application to

decode the beacon signal properly, we have to tell our application which field(s) in

the beacon signal stand(s) for what meaning. For example, a beacon that is

produced by manufacturer A uses fields #3, 4 and 5 in the beacon to transmit

hyperlinks. To decode the hyperlink that is sent by the beacon, we have to extract

data from fields #3, 4 and 5; not #6 or 7, not other fields. If we specify the layout

wrongly (e.g. using fields #5, 6 and 7 to decode the hyperlink), we will experience

results similar to Mojibake (e.g. using Big5-HKSCS to decode Unicode text), as a

result, seeing scrambled data.

Byte offset	Field content	Remarks
0	AD length	Must be 0x1A
1	AD type	Manufacturer-specific
2-3	Company Identifier	0x004C for Apple
4-5	Beacon Code	Must be 0x0215, which represents iBeacon advertisement
6-21	UUID	Usually same for all beacons owned by the same organization
22-23	Major	Used to distinguish a larger area, e.g. buildings or floor
24-25	Minor	Used to distinguish beacons in an area
26-27	TxPower	2's complement of calibrated TxPower

Table 2 Fields in an advertising packet

The problem of fragmentation of these beacon layouts here arises – different beacon manufacturers are very probably use their own standards, and different beacon layouts. Deploying beacons in an exhibition hall with beacons that are produced by different manufacturers, it is very likely that the cost of maintenance and installation is higher than only using beacons by one single manufacturer, as the beacons behave differently. It is suggested that to use one brand of beacon only when deploying in reality.

The Android Beacon Library supports scanning for beacons with different packet layout. To add capability for scanning iBeacons, the layout of iBeacon should be added with the following expression:

```
m:2-3=0215,i:4-19,i:20-21,i:22-23,p:24-24
```

4.2.4 TxPower, RSSI

TxPower is the standard level of power emission by a Bluetooth beacon exactly 1 metre apart from the point of detection. Like other properties of a beacon, TxPower can be calibrated (modified) by measuring the signal strength of a beacon.

iBeacons broadcast its TxPower along with its advertising packets. By decoding the advertising packets that iBeacons emit, we can easily obtain the standard power level of that beacon. By analyzing the measured signal strength and obtaining the TxPower of a beacon, we can estimate the distance between the user and the beacon.

4.2.5 Working mechanism

Unlike GPS, which broadcasts a timestamp, iBeacons only broadcast its ID (the UUID, major and minor triplets). We cannot determine one's location solely by the IDs emitted by beacons, mathematics should be involved to get a user's location. In other words, at least 3 beacons have to be deployed in an area to find out the location of a user that is in. After getting the signal strength of each beacon, we can use the preset coordinates of each of the beacons to calculate the position by the signal strengths of beacon. Details will be discussed in the section of Trilateration.

4.3 Android

Starting from API 18 (version 4.3), Android supports Bluetooth Low Energy. However, Android only supports Central and Peripheral profiles as of mid-November 2014. Android devices hold a Central profile when they are continuously looking for beacons nearby [23].

4.3.1 Permissions

Like other hardware sensors or communication parts, for instance, NFC, vibrator and GPS, using BLE requires declaration of permission in the Android Manifest XML file. Apart from the declaration of usage of Bluetooth, declaring the use of Bluetooth Admin is also required and the declarations should be the child elements of manifest, in others words, the permission declarations should be written between the manifest tags. Code snippets are displayed below:

```
<uses-permission android:name="android.permission.BLUETOOTH" />
<uses-permission android:name="android.permission.BLUETOOTH_ADMIN" />
```

If everything is successful, the permissions required by the application should show up in the application information page after compilation. After everything is set up in the manifest XML, we can start coding our app.

4.3.2 Setup

Before starting any Bluetooth activities, we can check if Bluetooth Low Energy is available on the phone. We can be sure that BLE is available and turned on by simply adding the <uses-feature> tags in the Manifest XML file. If BLE is not supported, we can either quit the application or prevent any Bluetooth scanning actions.

4.3.3 BluetoothAdapter

All Bluetooth actions require a BluetoothAdapter, including conventional Bluetooth scans and BLE, no exceptions. As of API 18 (version 4.3), BluetoothManager is proposed. We can get an instance by the following codes:

```
final BluetoothManager myBluetoothManager = (BluetoothManager)
getSystemService(Context.BLUETOOTH_SERVICE);
myBluetoothAdapter = myBluetoothManager.getAdapter();
```

4.3.4 Start Bluetooth

By running startLeScan(), we can look for BLE devices nearby. However, we should not infinitely look for beacons as the scan drains battery. Once the target device is located, we should stop scanning and restart only when the user manually request for another scan. We can scan for beacons by adding the following codes to our program:

```
private Handler myHandler;
/* scans for 10000ms */
private static final long SCAN_INTERVAL = 10000;
/* … */
myHandler.postDelayed(new Runnable() {
@Override
public void run() {
myBluetoothAdapter.stopLeScan(myLeScanCallback);
}
}, SCAN_INTERVAL);
myBluetoothAdapter.startLeScan(myLeScanCallback);
```

The code above scans for all kinds of BLE devices. To only look up for particular

devices, we can add one more parameter, a UUID objects array, to the method – call

startLeScan(UUID[], myLeScanCallback) alternatively.

4.3.5 Connect to a BLE device

Before starting any activities between the phone and BLE devices, we have to

connect them first. We can simply use connectGatt(), which accepts three variables,

to get the job done. The first parameter accepts a Context; the second parameter

tells the method to automatically connect once that device is visible; and the last

parameter accepts a BluetoothGattCallback.

```
myBluetoothGatt = device.connectGatt(this, false, myGattCallback);
```

The BluetoothGattCallback object provides a wealth of helpful information, for

example, GATT actions. By using onConnectionStateChange(), we can perform

actions once the BLE peripheral is connect or disconnected. Moreover, by overriding

onServiceDiscovered() and onCharacteristicsRead(), the Android device will be able

to read available services on the beacon and run specific codes based on beacon

characteristics, in other words, functions that the beacon can perform. Functions that

a specific type of beacon can perform depend on their profiles. The list of profiles is

available on the Bluetooth official website [24].

4.3.6 Read BLE device

Once connected to a BLE device, we can read and write values from and to it.
However, the values that can be read and written all depend on the features
available on the BLE device. In other words, the values are device-specific and we
have to check the specifications on the beacon manufacturer's website for details.
For example, using getUuid() can read the UUID from the beacon.

```
Uuid = gattService.getUuid().toString();
```

4.3.7 Notifications

Notifications here should not be mixed up with the notifications sent when beacons
are in range – we use onCharacteristicChanged() to keep track if there is any
modifications on the characteristics on the BLE device.

4.3.8 Close connection

When all BLE activities are done, simply call close() end the Bluetooth scans.

myBluetoothGatt.close();

4.3.9 Third Party Library

Although the official Android API provides methods to scan for beacons nearby, the API is not easy to use. For example, to scan a beacon, first we have to initiate the startLeScan method to start scanning. Next, we have to connect to a GATT Server (a visible beacon). Then, we broadcast updates from the beacon to the app and receive the updates through a listener. Finally, we can read the beacon attributes, such as UUID. Furthermore, to receive notifications from GATT servers, another method must be initiated. With this large amount of work for just obtaining little information from a beacon, we have chosen not to use the official Android API. Instead, we have picked some third-party open source beacon libraries for our application.

Table 3 shows the similarities and differences of two of the libraries that we have looked into. From the comparisons, we have adopted the Android Beacon Library, developed by Radius Networks, to develop our Android application. The Android Beacon Library supports more types of beacons, is able to get signal strength of beacon and allows background scans.

	Estimote SDK	Android Beacon Library
Developer	Estimote	Radius Networks
Platform	Android, iOS	Android
Standard	iBeacon	AltBeacon
Types of beacons supports	Estimote iBeacon	Any
Get basic information from beacon (e.g. UUID, major, minor)	Yes	Yes
Get signal strength	RSSI	RSSI and TX Power
Estimate distance	No	Yes (normalized over 20 s interval)
Background scan	Partly, relies on iOS' location services	Yes
Price	Free	Free

Table 3 Comparison between Android Beacon Library and Estimote SDK

4.3.10   Android 5.0 Lollipop

Though the new version of Android – version 5.0 Lollipop allows devices to work in Bluetooth Low Energy Peripheral Mode, we stay on Android 4.x for the development platform of the project. This mode grants the permission to devices to make Bluetooth connections to another. For example, Android devices can now transmit data, like heart rate, temperature and humidity, to one another through Bluetooth Low Energy. The new feature can improve the effectiveness of advertising through sending marketing data from electronic billboards to nearby mobile devices using the technology of Bluetooth Low Energy.

Even more, in Android 5.0, it allows devices to only scan for specific beacons that are specified by the application. This function can allow developers to increase the security of their beacon applications by elevating the difficulty of making "counterfeit beacons".

However, according to the developers' dashboards provided by Google (accessed on 8th April, 2015), the market share of Android 5.0 Lollipop is just 3.3% - 12 times less than KitKat, which has a market share of 40.9%. To provide backward compatibility of the application to the public, we have decided to stay on KitKat to develop our mobile application. Another reason of staying on Kitkat is that Lollipop is a rather a platform and the stability and security of it is unknown. To ensure our application works on more devices, we would still develop applications for a fairly mature platform [25] [26].

5 Indoor Positioning

5.1 Overview

Determining user's position is an important part of our project. Without the location, it is impossible to determine what exhibits is the user close to. Under the iBeacon standard, the TxPower of a beacon is broadcast within the advertising packet. The TxPower of an iBeacon is defined as the received signal strength indicator (RSSI, measured in dB) measured at a distance of 1 m. By comparing the strength of the iBeacon signal received by the phone with the TxPower of the iBeacon, it is possible to estimate the distance from the beacon to the receiver.

Traditionally, in an indoor exhibition navigation system, each object of interest (an exhibit, a product shelf etc.) is associated with one beacon. The object that the user is closest to can simply be determined by picking the detected iBeacon with the strongest signal strength. This deployment scheme is programmatically simple but inflexible. Whenever the layout of the exhibition changes, the location of the beacons must also be moved. Next, the exhibits database must be altered. Moreover, as the number of exhibits increases, the number of beacons to be purchased also increases.

To enhance flexibility and reduce deployment cost, it is suggested to deploy a fixed grid of beacons in the room and locate users mathematically. We have conducted several tests to investigate how this can be achieved. First, we attempted to use the distances from three nearby beacons to perform trilateration. As the result was unsatisfactory, we switched to a cell-based positioning method. To understand the best deployment strategy, we also did an experiment to analyse the characteristics of the beacon signals. The details of these tests are discussed in the following sections.

5.2 Deployment and Calibration

Before any of the tests, we first install the beacons at their designated places. Then, the indoor relative 2D coordinates of each beacon is measured with a rule and entered in our database. We used a Samsung Galaxy Note 3 Android phone to perform all the tests. When the phone detects a beacon, the indoor coordinates of it will be retrieved from the database for subsequent calculations.

After each beacon is deployed, its TxPower is calibrated using the test phone. The phone is placed stably at 1 metre distance from the beacon. Using the iBeacon Locate app developed by Radius Networks, the average RSSI of the beacon at 1 m over a 30 seconds interval can be measured. The beacon then has its TxPower value changed to the measured average RSSI using the eBeacon app, and restarted. This calibration process caters for the differences among individual beacons, the deployment environment of each beacon, and the differences among the receivers (the phone), which are not the factors that our tests shall look into.

5.3 Trilateration

Trilateration refers to positioning using distances from known points. In the 2D case, it requires at least three beacons to estimate one's location. However, the major difference from triangulation is that trilateration does not require angles to be calculated.

First, we measure the RSSI of all the visible beacons nearby. The RSSI of each beacon is temporarily stored in the mobile device's memory. Only the three beacons with the greatest (less negative) RSSI, in other words, the three nearest beacons, are used for calculations; while the information of all other visible beacons are discarded. We only use three sets of data from the three nearest beacons because we believe the interference and noise by the background acting on the beacons are less severe than farther ones. Using their calibrated signal strengths and hence the estimated distance to each beacon can be determined. We use the three estimated distances as the three radii of the three chosen beacons. Theoretically, beacons are point sources of signals. If there is no or only little interferences or noises, the signals should be transmitted radially outwards as a sphere. By calculating the intersection point of these spheres, the location can be calculated.

We have tested this method in a 12 m × 6 m room with some large obstacles imitating the real environment of a small exhibition room. Four beacons were installed on the roof in a rectangular shape to reduce the blocking effect of obstacles. The beacons were 3.6 m to 7.2 m apart. Since all beacons are deployed at the same height, the problem can be reduced to 2D by taking care of the height difference between the receiver and the roof. Let r_i, h_i and k_i be the height-adjusted distances from the phone to the ith beacon, the x-coordinate and y-coordinate of the beacons respectively. The user location (x, y) can be found by solving the following linear system:

$$\begin{cases} (x - h_1)^2 + (y - k_1)^2 = r_1{}^2 \\ (x - h_2)^2 + (y - k_2)^2 = r_2{}^2 \\ (x - h_3)^2 + (y - k_3)^2 = r_3{}^2 \end{cases}$$

Rearranging the equations, a linear system of two unknowns can be obtained.

$$\begin{cases} (-2h_1 - 2h_2)x + (-2k_1 - 2k_2)y + h_1{}^2 - h_2{}^2 + k_1{}^2 - k_2{}^2 = r_1{}^2 - r_2{}^2 \\ (-2h_2 - 2h_3)x + (-2k_2 - 2k_3)y + h_2{}^2 - h_3{}^2 + k_2{}^2 - k_3{}^2 = r_2{}^2 - r_3{}^2 \end{cases}$$

In ideal situation, the three measurements should be accurate and intersect at a single point, which is the location needed. Yet, in reality, there are lots of obstacles in the exhibition hall blocking radio signals emitted by the beacons. The mobile device might over-estimate the distance to the beacon due to reduced strength of radio waves received. The calculation formula can still give an estimated result even if the measurements are inconsistent.

The testing result indicates indoor trilateration using iBeacons is unsatisfactory. The fluctuation of location is huge. The signal of each beacon fluctuates greatly. We believe this is caused by the reflection of radio waves by the large objects, thus the beacon signals travel in multiple paths. The effect becomes very significant when there are large exhibits being placed in a comparably small room. When the fluctuation of three beacons adds up, the location is still extremely unstable.

As a remedy, we have tried using normalized distances, averaged over a short interval, to stabilize the signal. Further, we have used the signals from all four beacons to calculate four sets of coordinates and take its average. The results showed no improvement. Whenever the signal of one beacon fluctuates, the calculated location also fluctuates in all directions. We thus concluded that trilateration using iBeacons is impractical.

5.4 Quality of Measured RSSI

In Apple's implementation of BLE, any detected beacon only has its proximity available. The proximity has three possible values: Immediate, Near and Far. This design is probably due to the reliability of beacon signal and limited resolution in beacon distance. To evaluate the trustworthiness of the measured beacon signal strength, an experiment has been done to measure the fluctuation in RSSI measured by the phone.

We used the same test phone, Samsung Galaxy Note 2, to measure the RSSI of beacons. A custom mobile application was developed to scan for beacons and report the ID and RSSI of the beacons to a web page, which serves as a data logger. The test beacons were deployed on a wall in an open area and calibrated. Recording of RSSI was done at various points. At each point, 100 continuous samples of RSSI were taken. Yet, only the middle 60 samples were used for analysis to make sure the signal is stable. Two beacons of the same model, manufactured by Bytereal, will be used for the experiments.

The experiment involves measurement of two beacons at various distances. The experiment aims at measuring the fluctuation in RSSI and average RSSI, thus determine the range of distances that can be more reliably determined using measured RSSI. The measurements were taken at 0m, 0.125m, 0.25m, 0.375m, 0.5m, 0.75m, 1m, 1.5m, 2m, 2.5m, 3m, 4m, 5m, 7m, 9m, 12m and 15m apart from the beacon. Chart 1 to 2 show the results of the measurement.
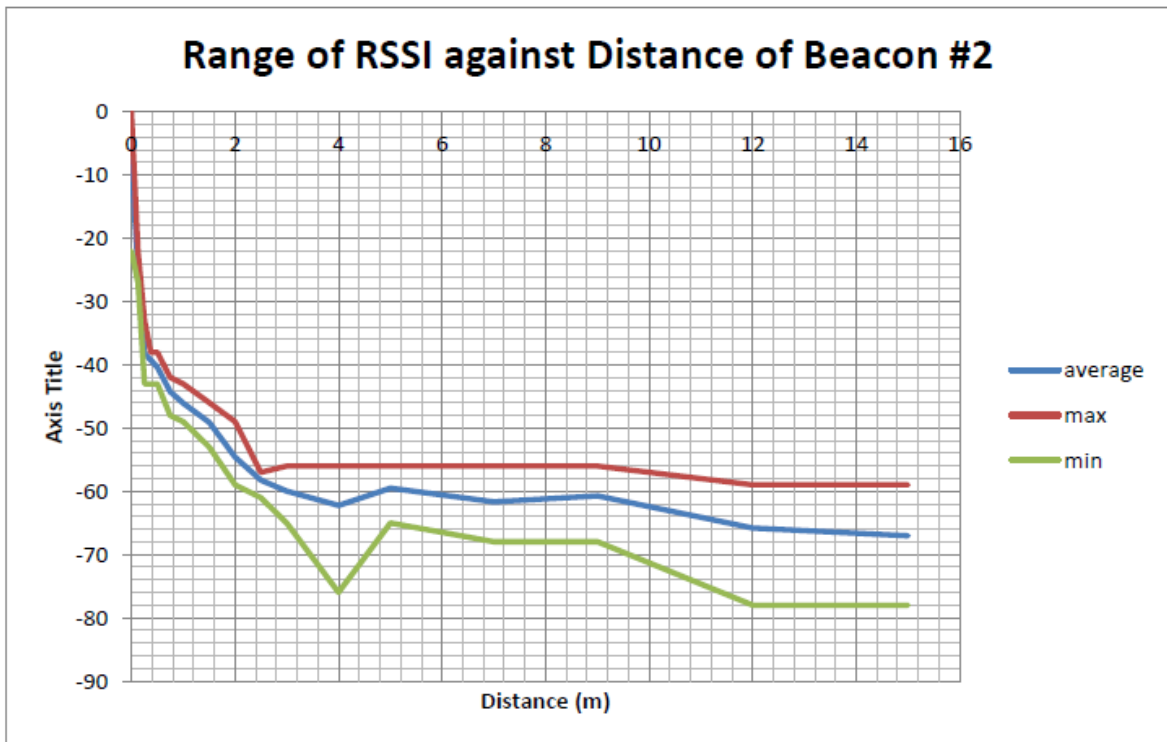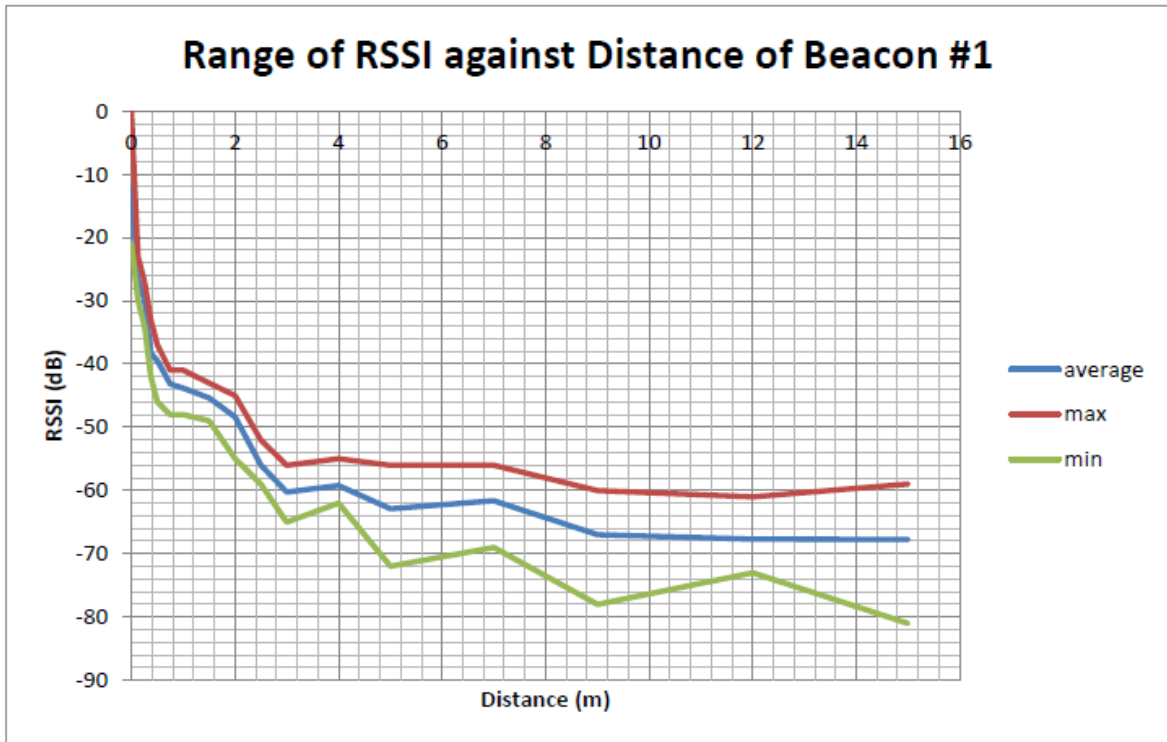
Chart 1 Range of RSSI against distance of the tested beacons

From chart 1, it can be seen that the average, maximum and minimum RSSI decreases with increasing distance. Yet, the drop trend flats out after 4m. The result is correct because RSSI is measured in logarithm scale. We believe the minor rises in the graph are due to multipath reflections and interferences in signal because of the environment.

If we take another approach, given the measured RSSI, can we confidently determine the beacon's distance from the phone? From the graph, it can be seen that the maximum measured RSSI start to flat out at 2.5m to 3m. Given this flat out value maximum, the range of possible distances can be as close as 2m to as far as 10m, which is meaningless. As a result, we believe that 2m to 2.5m is the maximum distance that can be ranged using iBeacons.
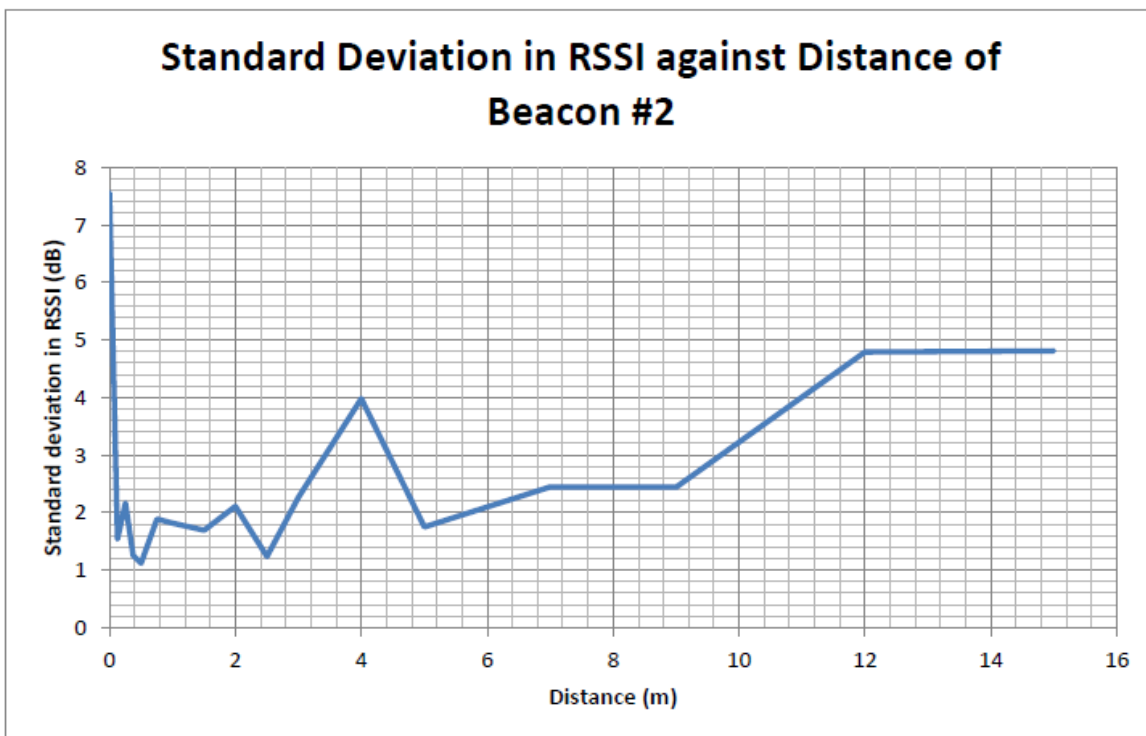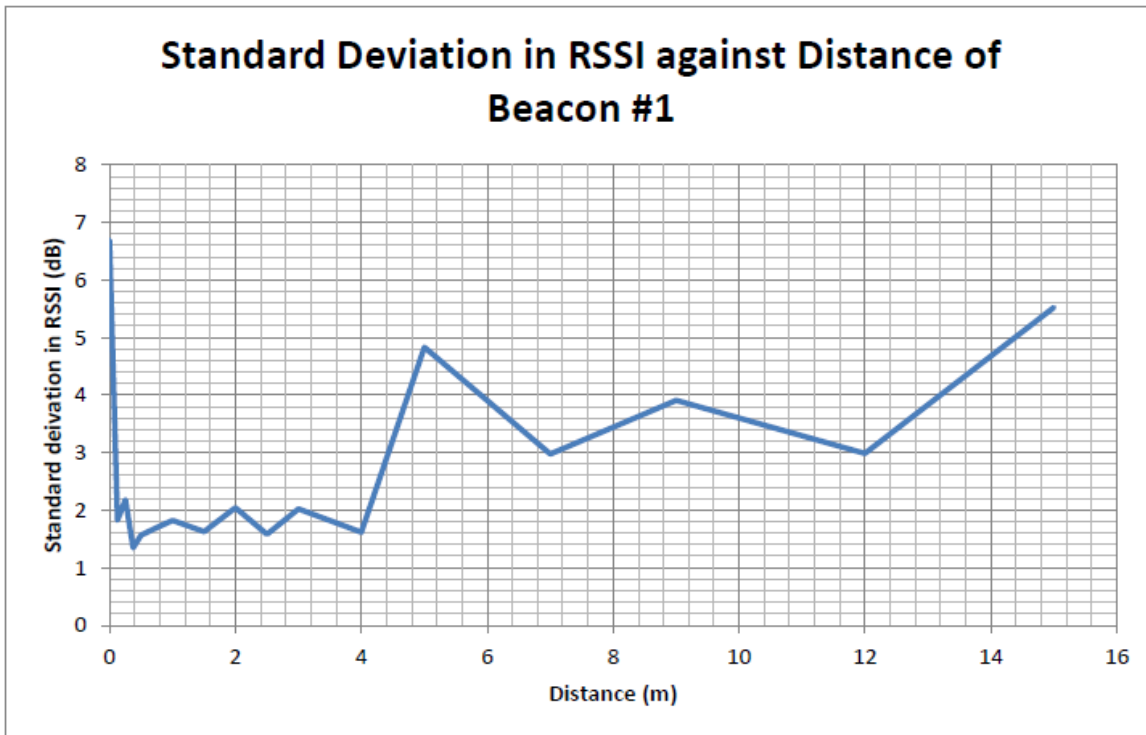
Chart 2 Standard deviation in RSSI against distance of the tested beacons

The standard deviations in RSSI have also been calculated and shown in chart 2. It can be seen that the standard deviation is highest when the beacon is very close to the phone, then reaches its minimum between 0.5m to 2.5m, and rises again. With the small fluctuation in RSSI at the interval, the stability of the measured distance can also be guaranteed.

We believe that the initial rise is due to the logarithm nature of RSSI and serious multipath reflections at the deployment point. A slight change in travelled distance can cause a big change in RSSI when the distance is short. Later, the deviation reaches its minimum because of minimal reflections at the distance. The choice of TxPower calibration at 1 metre is proved reasonable. After that, multipath reflections and interferences from the surroundings put the deviation on the rising trend again.

5.5 Cell-based Region Detection

After the previous tests above, we can conclude that Bluetooth beacons are never suitable for use in fine location determination – the electric current is often unstable, causing the output power fluctuate, and signals are often blocked, multiplied and absorbed by objects around them. We have slightly changed our approach to exhibition location determination – from exact coordinates to cell-based regions. In other words, we have sliced the exhibition hall various rectangular regions. Beacons are then placed on the wall of each side of the exhibition room and the method of beacon detection is same as above.

Instead of calculating the coordinates of the user, an estimated distance from the beacon is used to make guesses of regions in which the user is located. The guess is made independently for each region, involving 1 to 2 beacons. Sometimes, the power levels received by the mobile device by two beacons might be very similar. It is possible that there are multiple guessed regions. In that case, the conflicts will be solved algorithmically – by taking past history of guesses into account.

In the test scenario, four beacons were deployed at a 3m x 3m area. Each beacon is installed in the middle of the four sides, at coordinates (0, 1.5), (3, 1.5), (1.5, 0), (1.5, 3) respectively. The 3m x 3m area was divided into 9 square regions of 1m x 1m. In the four regions where the beacons are located, whether the user is inside the region is determined using one beacon. In the other regions, it is determined by two beacons. The region detection test setup is shown in figure 13 and 14.
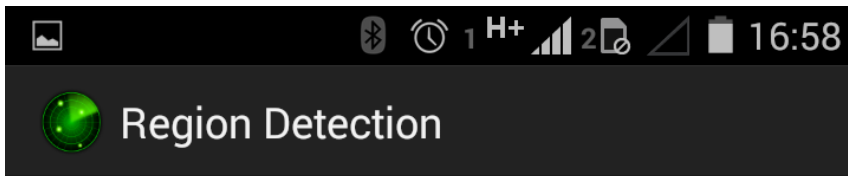
Region Detection

Start logging

Region detected:

region 1	region 2	region 3
region 4	region 5	region 6
region 7	region 8	region 9

1,3,2,1
0,0,0,0,0,0,0,0,2,8

Figure 13 Demonstration of region detection
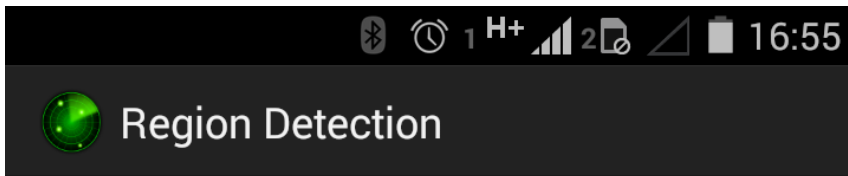
Region Detection

Start logging

Region detected:

region 1	region 2	region 3
region 4	region 5	region 6
region 7	region 8	region 9

2,3,2,0
0,0,0,2,0,0,8,0,0,0

Figure 14 Demonstration of region detection

By using this method of location determination, we have found that the degree of fluctuations in location is significantly lowered when compared to the previous two experiments. When the user is at the middle of a region, the detected region is stable. This method is safe enough to be deployed in use in production sites. Although the detection of region might hop back and forth at region boundaries, it can be solved using more sophisticated algorithms. For example, we can apply tougher restrictions in switching of guessed regions.

Although the position resolution using the region detection method is low, we believe that it can be enhanced by integrating with the traditional one-object-one-beacon system. In an exhibition, a fixed grid of beacons can be deployed for detection of region. For a finer location, extra beacons can be installed alongside each exhibit. Through this two-level deployment scheme, the advantages of both deployment methods can be capitalized.

To provide further flexibility on deployment, other phone sensors can be utilized as assistance. For instance the magnetic sensor on mobile devices can provide a relatively stable compass bearing. If a beacon is used in conjunction with the compass, one beacon can be mapped to up to 4 exhibition items. This is particularly useful in real exhibition settings, in which exhibits are usually placed close together with only one side facing the visitors.

6 Work of semester 1

The whole beacon system involves two parts, the Web CMS, API and an Android application. The CMS is used for adding, editing, removing and previewing beacon details; while the API is for getting beacon data from database quickly; and the Android application is the interface for exhibition visitors the view the extra information of the exhibits.

6.1 Android

Our application is designed to be as easy to use as possible. No or only little user intervention is required to operate the mobile application.

6.1.1 Interface to be shown to visitors

6.1.1.1 Welcome screen

A welcome screen is displayed when the user first enters the exhibition. The screen provides contains a full screen background image that can be changed according to different exhibitions. Beneath the welcome message, a button that links to the exhibition main page is shown. Users can tap on the link to learn more about the exhibition. Here in this phase, map data and exhibits are automatically downloaded in background. The design of the welcome screen is shown in figure 15.
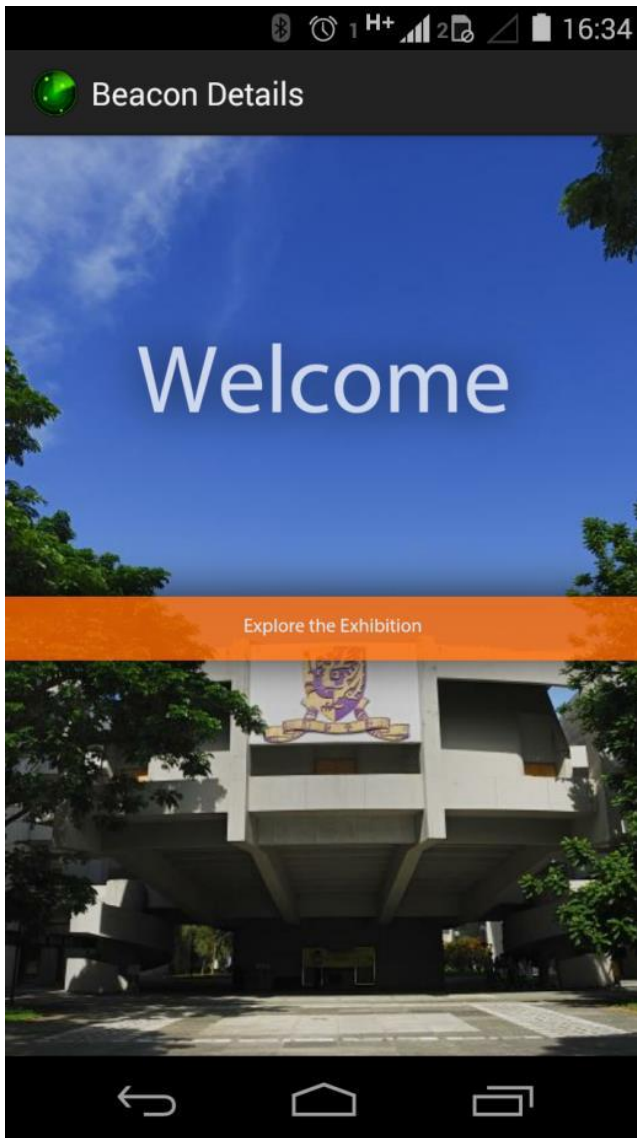
Figure 15 Welcome splash screen

6.1.1.2 Scanning for beacons

We understand that not all visitors of the exhibition are experts in Bluetooth
technology, so, we have to make everything as simple as possible by reducing user
interactions with the controls on the phone. Therefore, no button is required to be
tapped when scanning for beacons – the procedure of scanning for beacons is
automatically done in background.

<u>Exhibits / exhibition information page</u>

After a series of calculations of signal strengths emitted by Bluetooth beacons, we

use our own API to obtain data from the database that stores beacon, exhibit or

location information. A page of the location will then be chosen to be displayed on

screen. In this example, we have New Asia Ch'ien Mu Library. When the user taps on

the photo, the whole page goes black, leaving the image carousel visible, making

image preview easier. Figure 16 and 17 show the exhibits information page.

Figure 16 An example of results page
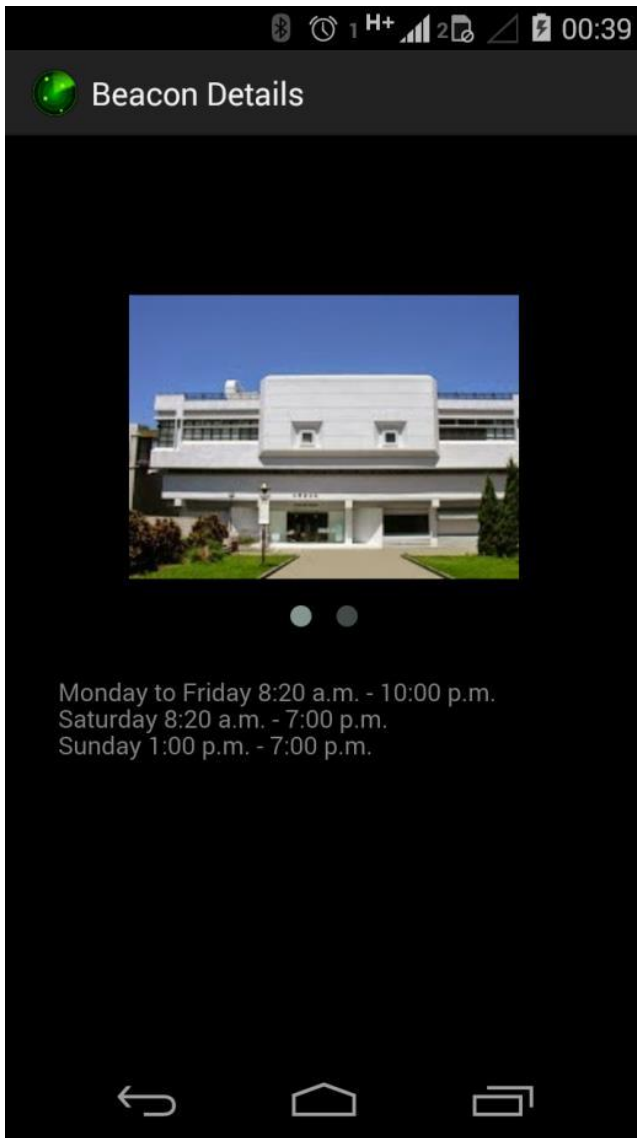
Figure 17 Background in black for easier image preview

6.1.2 Interface to be shown for internal testing

Our application also has a few pages for calibration and testing of the Bluetooth beacons. For example, there are testing of beacon regions, displaying the number and details of visible beacons and specific beacon details, including its coordinates and response from server using the information of that beacon.

Figure 18 shows the details of which region that the user is in and allows users to track log of the data transmitted by a beacon. For instance, RSSI (power level) detected, time, UUID, major and minor.
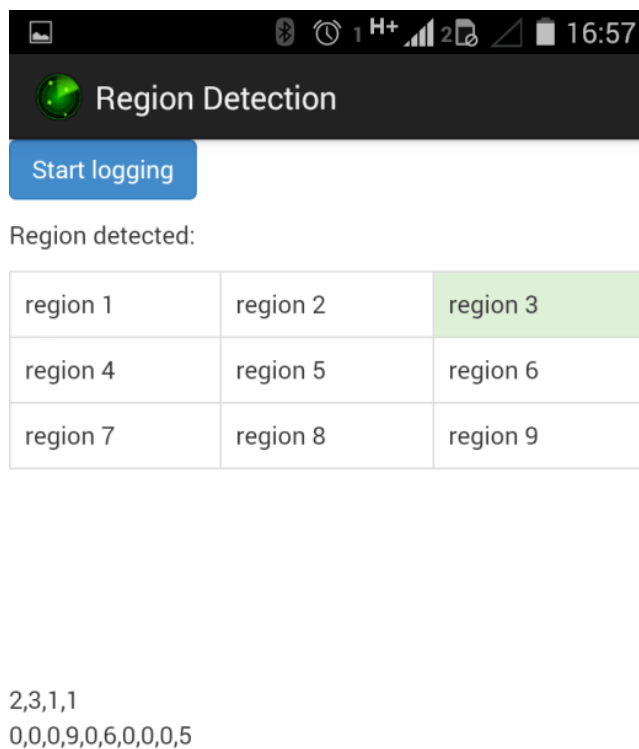
Figure 18 An example of region detection

Figure 19 shows a list of visible beacons, along with their details (IDs), for example,

UUID, major, minor, RSSI (power level), TxPower (standard power level measured 1

metre apart), name, estimated distance and average distance.
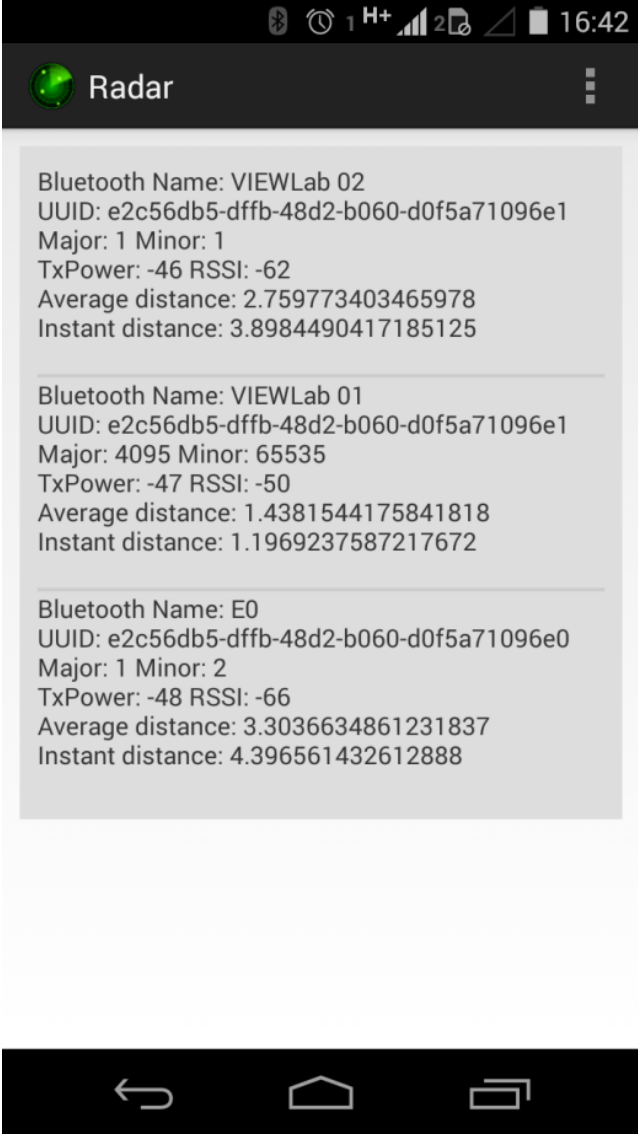
Figure 19 A list of scanned beacons

6.2 Web

6.2.1 Database

This application is for location estimation in exhibitions and those who hold the exhibition might not be professionals in the field of Bluetooth technology. We have to find a good solution to make setting up and updating exhibits information easy enough to use. Furthermore, in order keep the information in the application up-to-date, we believe maintaining the content inside the mobile application to be dynamic instead of static would reduce the cost of each update and ensure visitors will not receive outdated information if they refuse to update the application.

A MySQL database has been deployed for this purpose. We have created a few tables inside the database to store information of each beacon. For example, the location in term of indoor coordinates relative to the room, IDs, exhibit data like titles and descriptions to be shown to the public.

Figure 20 shows a screen capture of our database storing beacon information, including the ID, UUID, major, minor and its description.

Figure 20 Our database storing beacon details

6.3 CMS

However, updating the database through command line or phpMyAdmin might still be too difficult for people who work in museums or supermarkets as they are not IT professionals. Therefore, we have created an easy-to-use online CMS to easily add, edit, delete and preview the beacon settings.

6.3.1 Dashboard page

The dashboard page, shown in figure 21, gives an overview of all beacons in the database.

| Dashboard | | Add | | Edit | | Remove | | Preview |

Beacon info

All beacons

ID	UUID	MAJOR	MINOR	LONGITUDE	LATITUDE	DESCRIPTION
1	B9407F30F5F8466EAFF925556B57FE6D	3344	5566	114.2073102	22.4179243	SHB
2	B9407F30F5F8466EAFF925556B57FE6D	2	102	115 9 E	23 18 3 N	
3	B9407F30F5F8466EAFF925556B57FE6D	3	103	116 9 E	23 17 2 N	Hello World!
5	B9407F30F5F8466EAFF925556B57FE6D	5	105	118 9 E	24 17 2 N	
8	B9407F30F5F8466EAFF925556B57FE6D	8	108	121 9 E	26 18 3 N	
10		10	110	123 9 E	27 18 3 N	
11		11	111	124 9 E	27 17 2 N	
15		15	115	128 9 E	29 17 2 N	
17		17	117	130 9 E	30 17 2 N	
18		18	118	131 9 E	31 18 3 N	
19		19	119	132 9 E	31 17 2 N	
20		20	120	133 9 E	32 18 3 N	Some more
21		21	121	134 9 E	32 17 2 N	
22		22	122	135 9 E	33 18 3 N	
23		23	123	136 9 E	33 17 2 N	
24		24	124	137 9 E	34 18 3 N	
25		25	125	138 9 E	34 17 2 N	Last one!
137		1234	5678	hfifjr	hfidnr	hello world
139		1020	3040	long	lat	Was ist das?
172	B9407F30F5F8466EAFF925556B57FE6D	5555	6666	-74.044581	40.6895698	english 中文 עברית ไทย русский ﺍ にほんご
173	B9407F30F5F8466EAFF925556B57FE6D	6666	7777	11.582154	48.152359	<script>alert('xss');</script>
186	E2C56DB5DFFB48D2B060D0F5A71096E0	1	2	2.5	4	Bag
187	E2C56DB5DFFB48D2B060D0F5A71096E2	1	1	1	2.5	MATSUSHO retract

Figure 21 Dashboard page showing a list of beacons

6.3.2 Adding a beacon
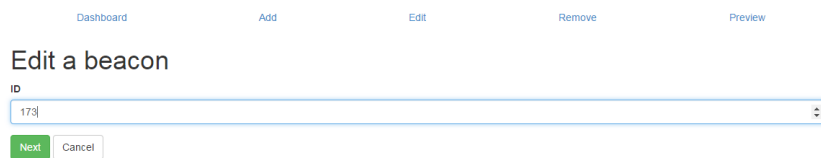
User can add the UUID, major, minor, coordinates in terms of latitude and longitude and descriptions in the "Add a beacon" page shown in figure 22. A success message will be displayed if the insertion is successful.

Figure 22 Page for adding a beacon

6.3.3 Editing a beacon

User can modify beacon information by entering the beacon ID. After that, a page

similar to the adding a beacon is displayed. This page shows the current value of

each field of a beacon. If no changes have to made, just click the cancel button to

exit from this page or just click the edit button but without changing the values of

each field. A success message will be displayed if the editing is successful. The flow

of editing a beacon is shown in figure 23 to 25.

Figure 23 Edit a beacon using its ID

Edit a beacon

OWNER

97d9e7b3f06ef1234e15613ebb6663eb

ID

173

UUID

B9407F30F5F8466EAFF925556B57FE6D

MAJOR

6666

MINOR

7777

LATITUDE

48.152359

LONGITUDE

11.582154

DESCRIPTION

<script>alert('xss');</script>

PUBLIC DESCRIPTION

optional

PUBLIC TITLE

optional

PUBLIC SUBTITLE

optional

EDIT   DELETE   CANCEL

Figure 24 Edit beacon details

Editing succeeded.

Dashboard   Edit more
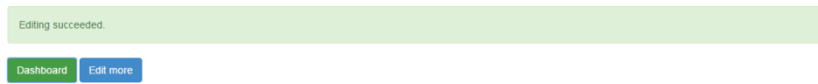
Figure 25 Success message after editing a beacon

6.3.4 Removing a beacon

User can remove beacon information by entering the beacon ID. After that, popup message for removal confirmation is displayed. To cancel the deletion, simple click the cancel button to return to the page. Otherwise, click OK to continue to the deletion. A success message will be displayed if the removal is successful. The flow of beacon removal is shown in figure 26 and 27.
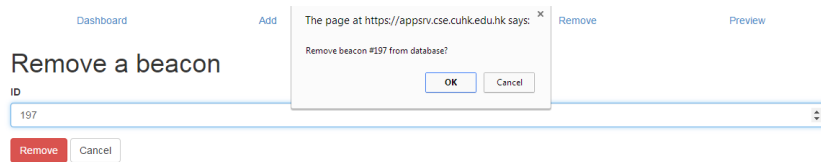
Figure 26 Remove a beacon using its ID
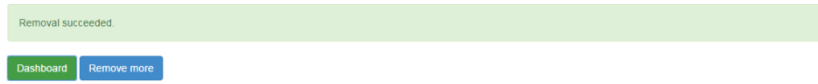
Figure 27 Success message shown after removing a beacon

6.3.5 Previewing a beacon

To see the beacon details on the Web without using the phone, click the preview button on the top bar. The preview page will then show up. By entering the beacon details, including UUID, major and minor, a preview page of the beacon will appear. This page should be identical to the one shown on the phone's application. Figure 28 and 29 illustrates the preview.

Figure 28 Preview a beacon using its details
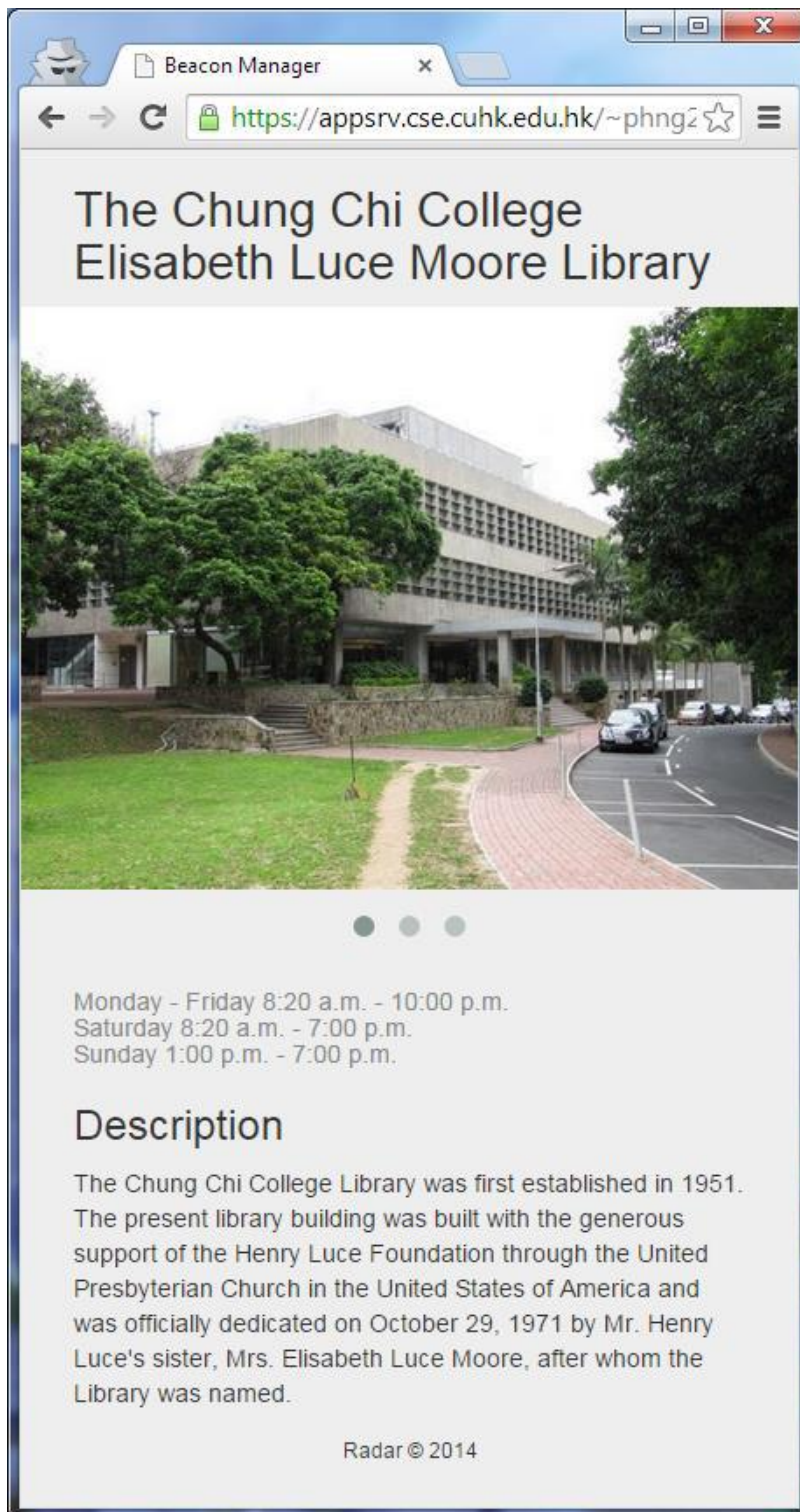
Figure 29 Preview a beacon in browser, as in the mobile application

6.4 REST API

To get response, like calculations of locations and beacon information, from the
server easier, we have written our own REST API from scratch. As a complement, an
API documentation has been prepared as shown in figure 30.
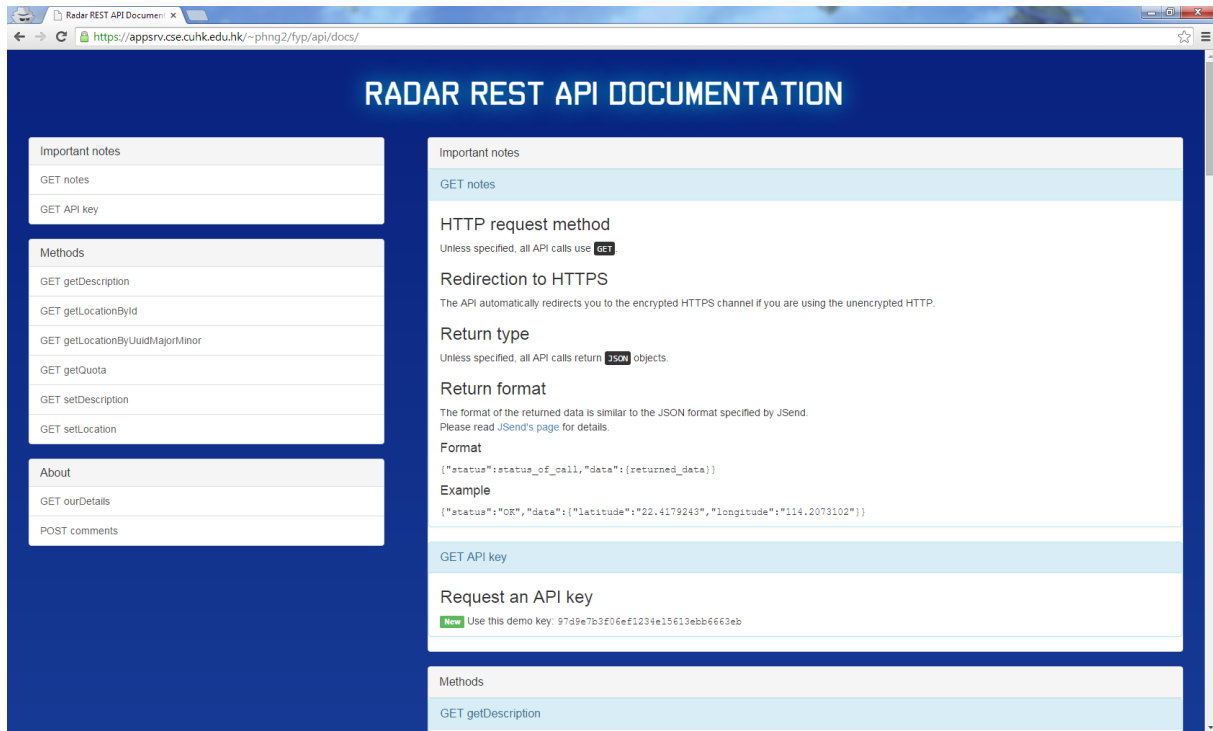
Figure 30 Our API documentation page

The API uses the GET method for requests to ease the deployment and usage. No matter the query result is successful or not, for instance, failures due to invalid parameters, the API can still return a message to users to notify them the results. An example API call is shown in figure 31.
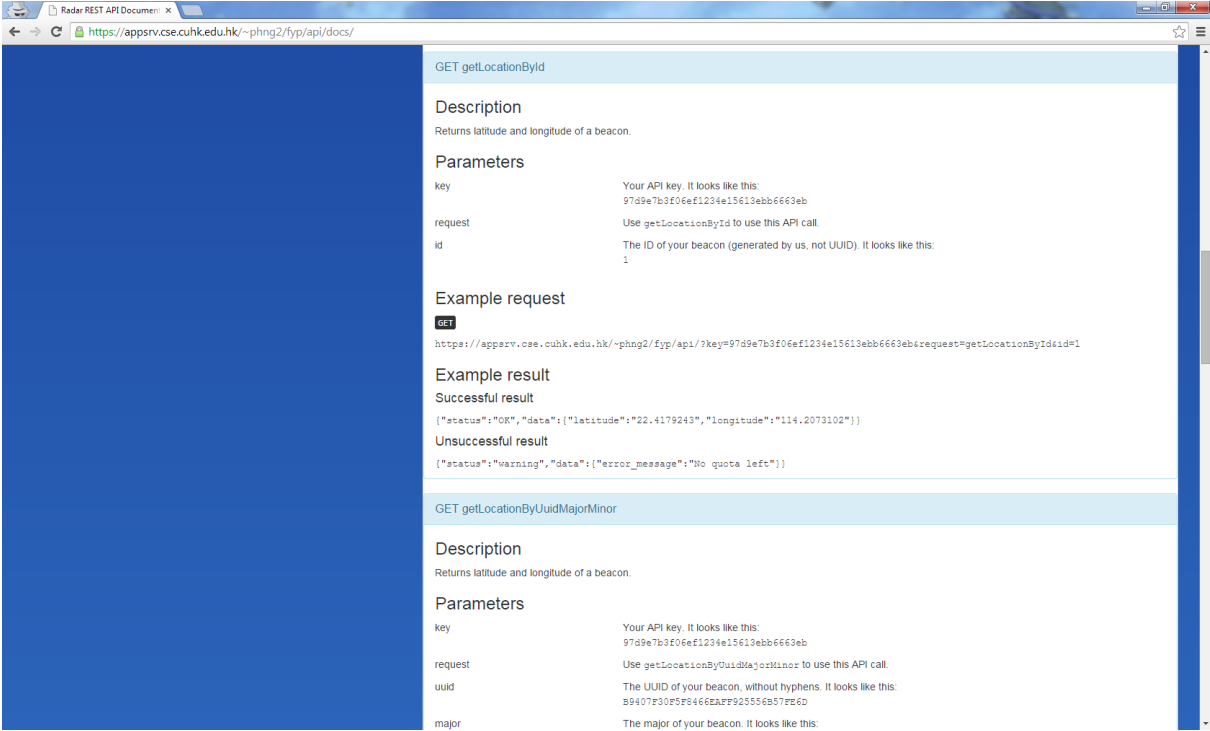
Figure 31 Example of an API function call

Successful and failed results using the method getLocationByUuidMajorMinor are displayed below:

Successful results

```
{"status":"OK","data":{"latitude":"22.4179243","longitude":"114.2073102"}}
```

Failed results

```
{"status":"warning","data":{"error_message":"No quota left"}}
```

6.5 JSON

6.5.1 What's so good about JSON?

We have dug into the details of different formats of delivering data through the
Internet. We have chosen common formats, JSON and XML for comparisons for the
API. Table 4 shows some of the similarities and differences of the two formats.

Features	JSON	XML
Cross-platform	Yes	Yes
Human-readable and writable	Yes; yes, key-value pair delimited by a colon	Yes; no, value surrounded by key tags
Unicode	Yes	Yes
Size	More compact	Bigger

Table 4 Comparison between JSON and XML formats

6.5.1.1 Cross-platform

Both JSON and XML are now supported in major operating systems, including
smartphones. APIs for encoding and decoding JSON and XML are provided in many
languages, for example NSJSONSerialization in Objective C, getJSONArray and
getJSONObject in Java, JSON.parse and eval in JavaScript and many more
languages. XML can also be easily ported to many systems. With the great portability
of JSON, we do not have to worry about different implementations of the API in
different operating systems and languages.

Both JSON and XML are designed to be easily read by humans. However, values in

XML are surrounded by their key tags, which make writing data in XML format

becomes a lot of hard work. Imagine you have missed a slash after the closing tag in

example 1 and swapped two closing tags in example 2 when you are coding in XML:

Example 1:

```
<beacon>
<property>
<id>2<id>
<!-- a slash should appear in the 2nd id tag above -->
<public_name>Entrance</public_name>
<private_name>west_ent_7</private_name>
</property>
</beacon>
```

Example 2:

```
<beacon>
<property>
<id>2</id>
<public_name>Entrance<private_name>
<!-- public_name closing should appear after "Entrance" -->
</public_name>west_ent_7</private_name>
<!-- private_name opening tag should appear before "west_ent_7" -
->
</property>
</beacon>
```

These two cases will not happen in JSON as it does not use closing tags. Debugging in XML uses us way more time than JSON. We want to let our developers to use our make their applications as quick as possible and spend less time on debugging. Therefore, we have chosen JSON to return our response from server.

6.5.1.3 Speaks Unicode

Both JSON and XML support Unicode. Displaying text in different languages using both formats will not be a problem using our API.

6.5.1.4 More compact

As JSON do not require closing tags to enclose values, it is very often to have smaller size in JSON than XML objects to represent the identical data. Smaller size implies the transfer of data over the Internet requires less time, and hence, reduces the overhead of processing response on the mobile device locally.

6.6 Documentation

We have set up a site for documenting the functions that are provided by the API.

The site does not only contain a list of functions, but also example uses of the API,

successful and failed results of function calls parameters and descriptions of the calls.

Figure 32 and 33 show the interface of the API documentation site
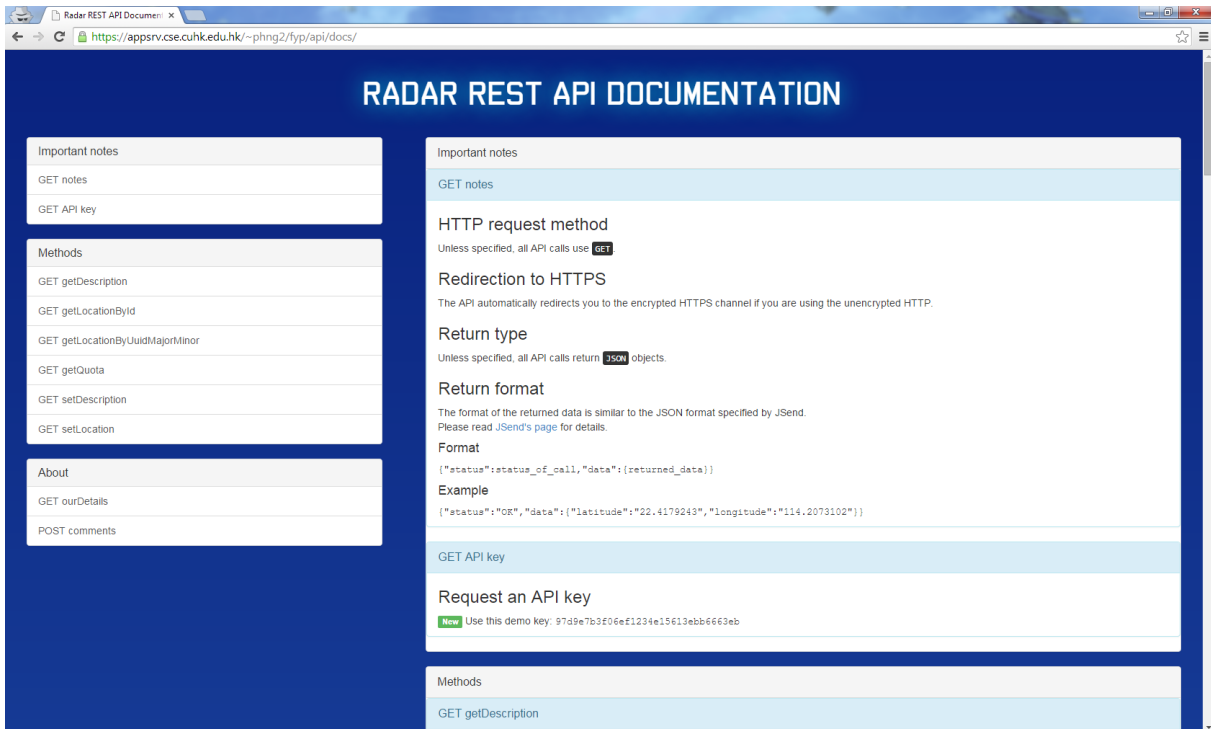
Figure 32 Interface of our API documentation site
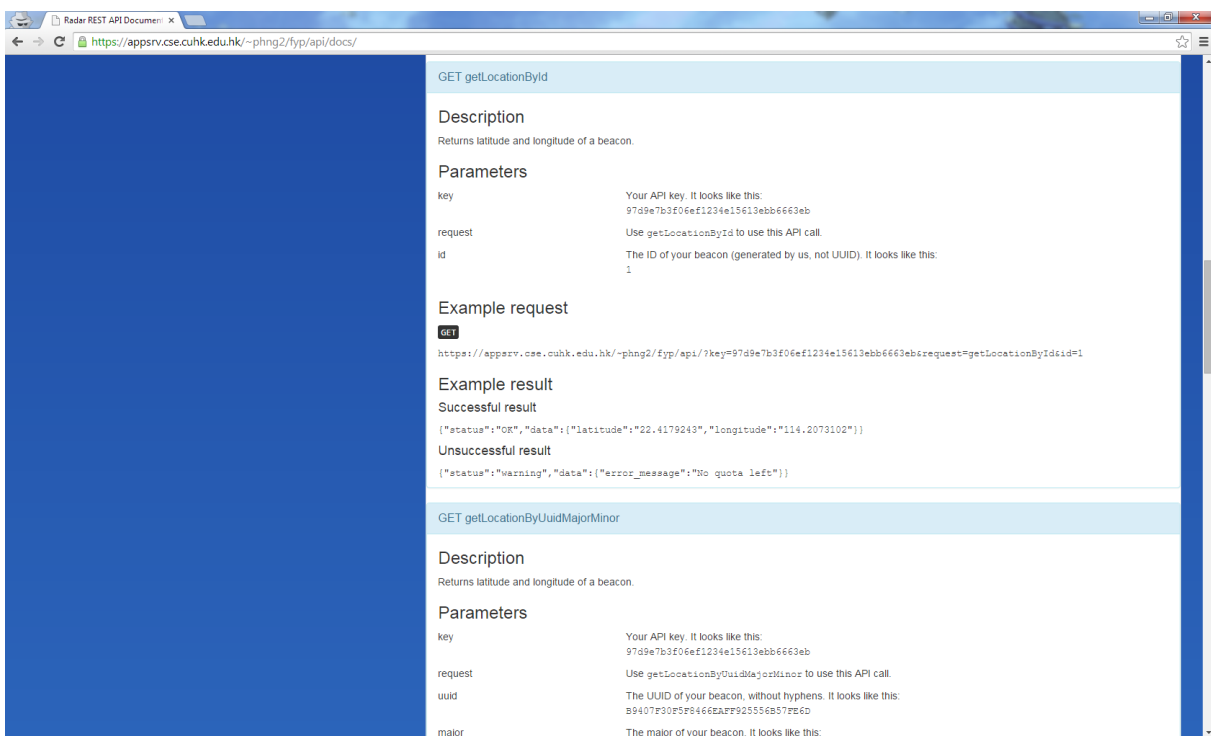
Figure 33 Interface of our API documentation site

7 Work of semester 2

7.1 Overview

In the last semester, we have:

- made an Android application to test out the beacon signals, to detect the difference of signal absorbance of various kinds of surface and to find out the best deployment scheme;

- made an Android application to detect beacons and show exhibit details;

- conducted multiple experiments to test out the impact of environment noise on beacon signals;

- created a RESTFUL API to allow developers quickly develop mobile applications on both iOS and Android platforms by fetching data and modifying data from database;

- written an easy-to-read API documentation; and

- built a simple CMS to allow museum or exhibition owners quickly modify exhibition details.

After the previous semester, we have reviewed our work once again and made the conclusions below:

- Always deploy beacons on wall, not on the floors or the ceilings. Deploying beacons on the wall helps reduce signal absorbance and reflections by floors and light shields on the ceilings respectively.

- Put beacons at least 2 meters apart. They should never be too close or too far away. Putting beacons too close together will cause interferences of beacon signals while putting them too far away will cause their waves to be flat out by environment noises.

- Do not provide background scans, even it is easy to do. Scanning in the background drains battery. According to our experiment in the University Library, we have built an Android application to scan for beacons in the background and we scanned for beacons for half an hour, about 25% percent of battery is used in the application. Therefore, we have removed this feature in the later versions of our Android application.

- Developing beacon applications is difficult as the environment fragmentation on Android is severe. According to the results of one of our experiments in the previous semester, even we put different phones in equal distance to a beacon, the two phones will read different signal strength of the beacon. Therefore, we have to calibrate the beacons and hold the phone in upright position with back of the phone not being blocked by the hands to ensure signals recorded by the phone is accurate.

- There is a serious security problem with beacons - everybody can scan for beacons nearby and copy the UUIDs, majors and minors to their own beacons to replicate an exhibition or museum in their place. Because of this, we suggest that beacons should only be used for information that is publicly available and is not sensitive. Anything that is private and related to monetary transactions is not recommended to be used with beacons. In this case, NFC or RFID is recommended.

As we have seen the huge opportunities of beacons in the fields of business, education, entertainment and tourism, and the ecology of the beacon community is still developing, we hope to contribute to the global beacon community, so, we have decided to continue of the project on exhibition navigation using iBeacon.

In this semester, we have:

- revamped the design of the CMS and rewritten the codes of it;

- added new features to the CMS, including:

  o click to edit positions of beacons,

  o linking multimedia items to exhibits,

  o analytics of visitor information,

  o automatically backing up exhibition information,

  o rolling back of exhibition information and

  o one-click deployment of exhibition information;

- redesigned the layout and workflow of the Android application;

- enhanced the functions of the API;

- deployed beacons in the ICT Expo in the HKCEC;

- built a CMS specifically for the Museum of Climate Changes and

- received feedback from the public regarding the Android application and the CMS.

7.2 Analysis

This semester, as we have much more time in developing the system, we have decided to review our system again to enhance the user experience.

7.2.1 New CMS

A new CMS shall be developed to include new features and provide a more professional user interface. Various requirements of the new CMS are discussed below.

7.2.1.1 Login screen

In the new CMS, we allow access of multiple users using the same CMS. Therefore, a login screen must be present.

7.2.1.2 Main screen

We understand that not all users are experts in BLE technologies and might not understand the UI of the CMS easily, so we have made a more intuitive UI to users. Instead of using tables to display information, we use squares to represent the exhibit. One square stands for one exhibit. Adding a square means adding an exhibit and removing a square stands for removing an exhibit. As it is very probable that there is more than one section in a museum, users can also sort and filter the exhibits using the type of sections filter above the squares. Exhibition owners can also sort and filter exhibit according to the sections and names and IDs respectively. On the left, users can add, commit, restore and delete exhibits. They can also change the exhibition settings and see the exhibition overview easily by clicking buttons on the left.

7.2.1.3 Preview

Simply clicking on the square of the square brings the user to the preview screen of that item. The content viewed here is exactly the same as the one view by the visitors so that exhibition owners can know if there is any error at a glance.

7.2.1.4 Top bar

Hover the mouse above the top bar at the main screen to quickly get to backup, current exhibition and the next exhibition easily. By default, only the name of the stage that the user is at is shown to improve readability. When the bar is hovered, all 3 phases would be shown and arrows with directions to improve intuitiveness of the flow of work.

7.2.2 Frontend framework selection

We hope to provide the best user experience to users, so, we have selected 3 of the most popular frontend framework to be the candidates of the framework of the new CMS. Table 5 shows the comparison of these 3 frameworks:

	Bootstrap	Foundation	Semantic UI
Stars	**79,967**	19,834	16,423
Forks	**31,384**	4,259	1,773
Watch	**4,805**	1,425	899
Size	145KB	326KB	441KB
Responsive	**Yes**	**Yes**	**Yes**
Mobile-compatible	**Yes**	**Yes**	**Yes**
Grid	**12 columns**	**12 columns**	16 columns
Browsers supported	**Chrome, Firefox, Safari and IE8+**	Chrome, Firefox, Safari and IE9+	Chrome, Firefox 36, 37, Safari 6, IE9+* (compatible with IE9 with prefix only)
License	**MIT**	**MIT**	**MIT**

Table 5 Comparison between various web frontend frameworks

From table 5, it can be seen that there are more advantages in Bootstrap when compared with Foundation and Semantic UI. As a result, we have chosen Bootstrap as our frontend framework.

7.2.3 Database

We have renewed the database schema to speed up the time of query and ease development of the API and CMS. For example, we have split the tables of storing beacon information from one into three to enable backup and preparation of the next exhibition. Yet, we have continued using MySQL as our database as both of our members are familiar to MySQL and it is free-of-charge. To speed up the time of development, we use phpMyAdmin as a plugin to create MySQL databases and manage data.

The updated database schema will be introduced in the following section.

7.3 Design

7.3.1 New CMS

7.3.1.1 Multiple users, multiple exhibitions CMS

The new CMS now supports multiple users. Each user corresponds to one exhibition which can be managed using the CMS. This feature allows our system be reused in different museums and exhibitions without hosting another CMS and database. Figure 34 shows the design of the login screen, which enables the multi-user capability.
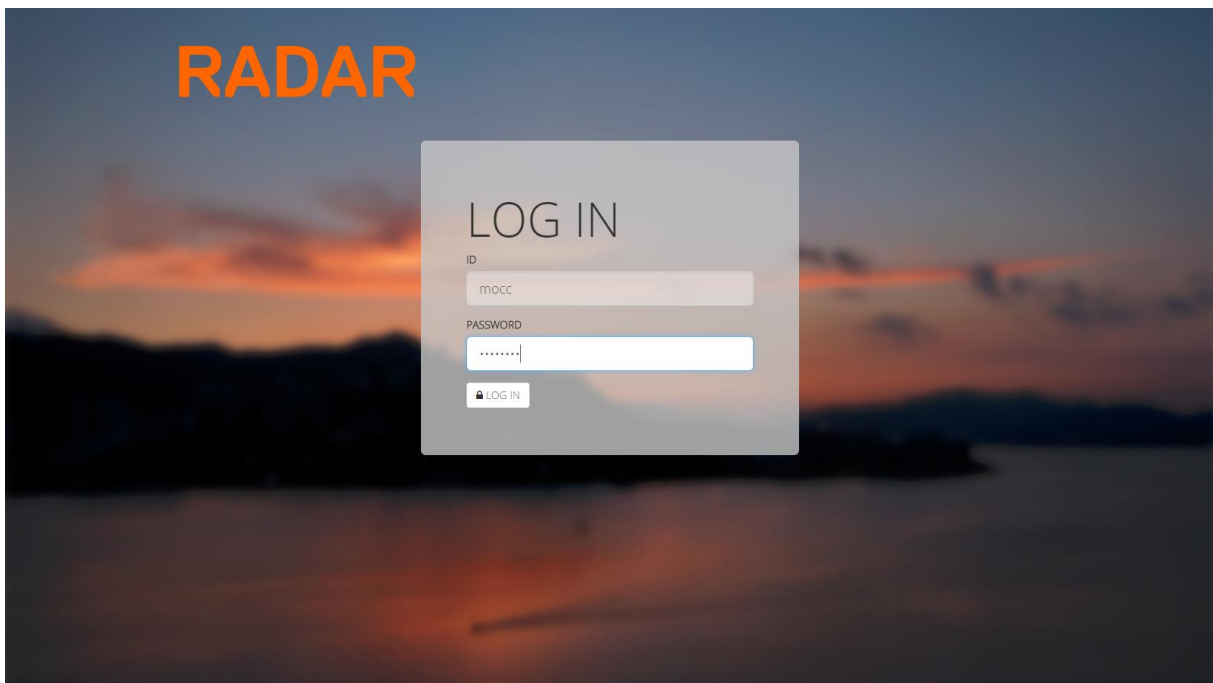
Figure 34 Login screen of the CMS

7.3.1.2 Home page

The home screen is now divided into 3 sections - backup, current exhibition and next exhibition, as shown in figure 35.
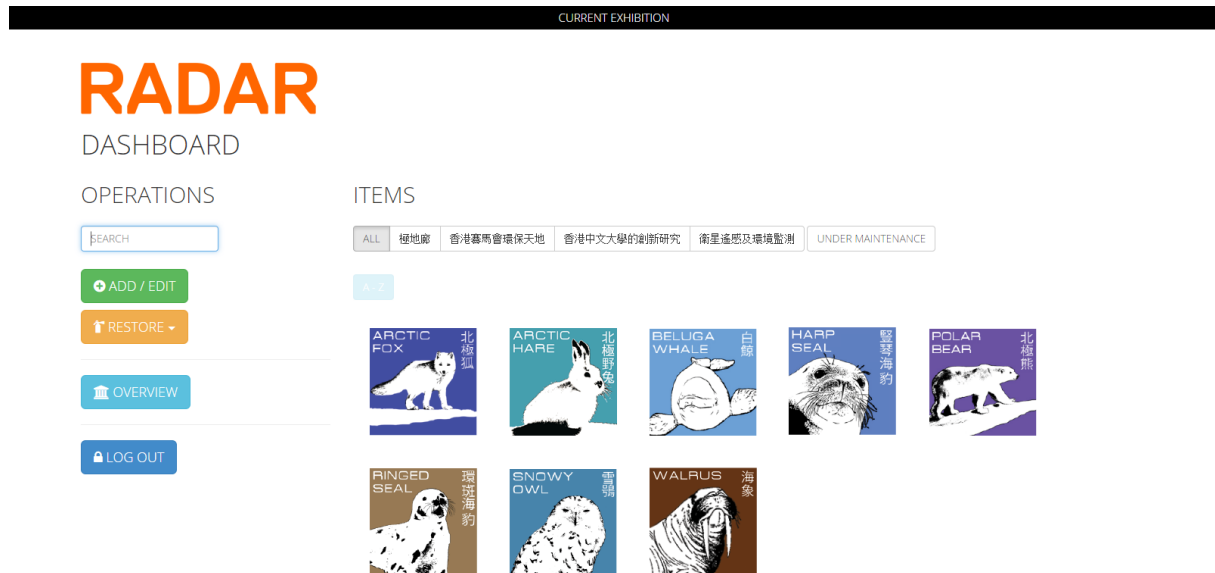
Figure 35 Main screen showing the current exhibition

7.3.1.2.1 Backup

The backup section automatically stores all exhibition items and exhibition information whenever user commits the next exhibition information to the current exhibition. All data in backup is read-only to prevent data is being overwritten. Whenever new data is committed again, all old backup data is flush away.

7.3.1.2.2 Current exhibition

Current exhibition shows all exhibits and exhibition information. Users can quickly preview exhibit information using the preview function. Similar to backup, users cannot modify any exhibit information here - they have to add, edit or remove them and commit their changes in the next exhibition section before changes go live. A link will bring them to the right place to edit the details in the next exhibition. This guarantees changes in the CMS will not interfere with the current information in use. Again, data can be restored from backup or the next exhibition section if anything goes wrong.

7.3.1.2.3 Next exhibition

This is the only section that users can modify data in the database. Users can add, edit and remove exhibit details here. After reviewing everything and users are satisfied with the data, they can commit changes and push the data to the current exhibition. The changes go live and they will be reflected on the phone and the Web immediately. The old data in the current exhibition set will be saved in backup. Users can restore the data if anything goes wrong.

7.3.1.3 Filter by area or type

The button bar above the items allows users to filter the beacons by location or types, as predefined by exhibition owners. They can also see which beacons are under maintenance. Figure 36 shows the filter bar.
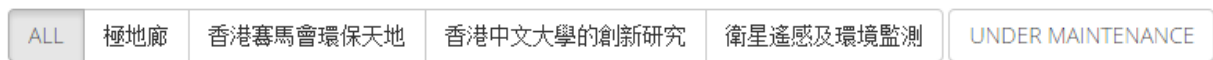
Figure 36 Filter bar

7.3.1.4 Items sorting order

The exhibition items can be sorted in different orders. For exampke, to get the exhibit that is the most popular among visitors, simply click the visitor count button on the second bar above the list of exhibits. The squares will then be sorted and exhibition owners can get the exhibit with the maximum and minimum number of visitors easily. The sort order can be chosen by clicking on the sort bar, shown in figure 37.
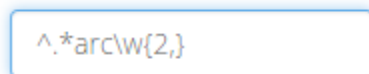
Figure 37 Sort bar

7.3.1.5 Search by regular expression

We understand that ordinary search is not powerful enough to look up an item out of many in a short time effectively. Therefore, we have built a new search which supports regular expression. For example, "uc" and "uc*" will provide different search results - the former shows results that contain "uc" while the latter will only provide results that contain "u" and an arbitrary number of "c". Both of the search patterns are case-insensitive. The search feature can be accessed from the search box on the left of the home page. An example search query is shown in figure 38.

Figure 38 Search by Regex

7.3.1.6 Add an exhibit

Simply click the big green button on the left to add a new exhibit to the next exhibition. If you are at the current exhibition, you will be brought to the new exhibition automatically.

In the new add page, you can add multilingual titles to the exhibit. You can also specify the location of it by clicking on a floor plan. Moreover, you can define the location, major, minor and UUID of the beacon. In this version of CMS, we have added a functionality of embedding multimedia items including multilingual descriptions, audios and videos to the beacon. Figure 39 illustrates the "Add" page.

Figure 39 Adding an exhibition item

7.3.1.7 Preview

Users can quickly preview beacon details by clicking on any one of the beacon. They will then be brought to a new preview page which shows all the beacon details, including the title, descriptions, cover photos, multimedia items and some statistical figures. Users may also switch between Chinese and English versions of the page.

For exhibition items in the current exhibition, users can temporarily hide an item from all visitors by marking it as "under maintenance". To switch the maintenance status, simply hit the switch on the preview page. The item will then be hidden from the phone application.

Figure 40 illustrates the "Preview" page.
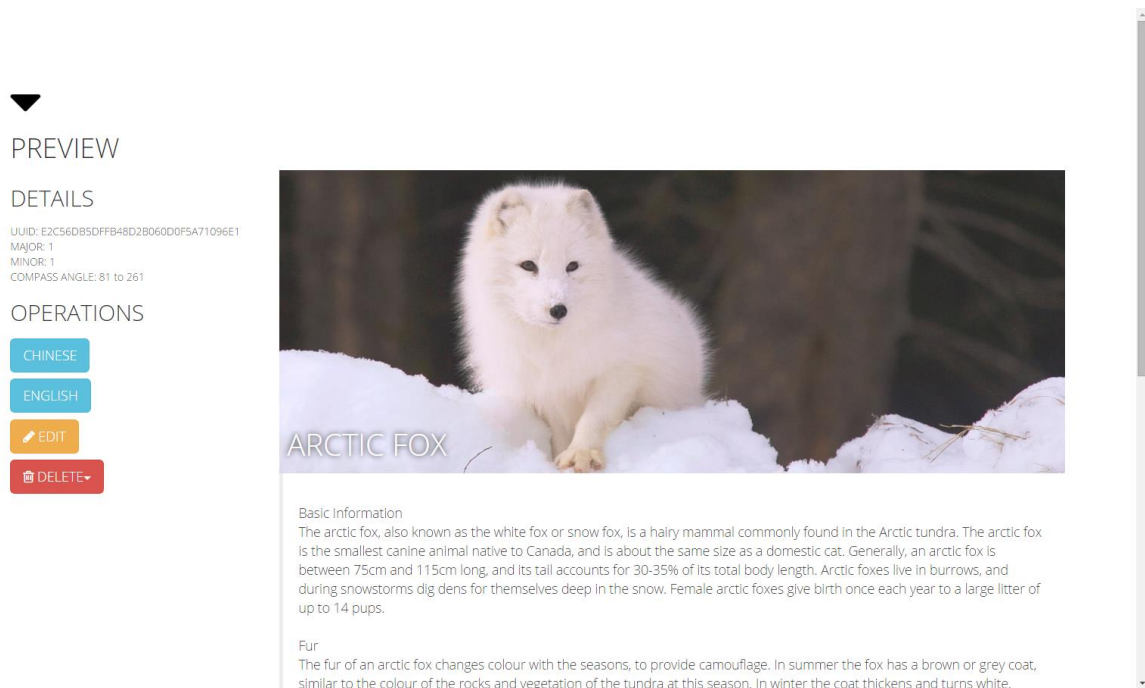
Figure 40 The preview page

7.3.1.8 Edit

Similar to add, users can modify all settings that are inputted by them during the 'add'
phase. However, they can only edit beacons that belong to them. This restriction
applies because beacons associated to other users cannot be modified by the others
without permission. Figure 41 shows the "Modify" page.

Figure 41 The edit page

7.3.1.9 Remove (all)

In case of any of the beacons are removed from the exhibition, exhibition managers can remove the beacon information in the preview page of that beacon. To quickly remove all beacons to have a clean workplace, just click the 'Delete all' button in the home page, as shown in figure 42.
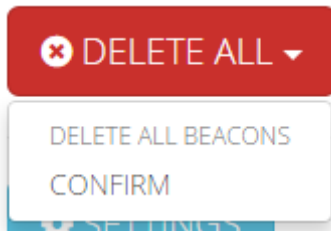
Figure 42 Quickly delete all exhibition items

7.3.1.10 Restore

If anything goes wrong, users can simply click 'Restore' to reset all data from backup or the next exhibition to the current exhibition. All it takes is just a click with another confirmation. The restore button, as shown in figure 43, is also located in the home page.
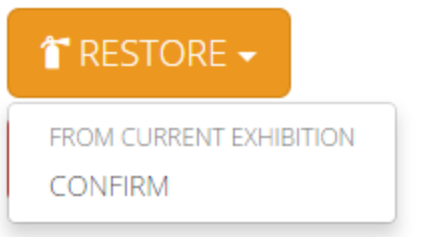
Figure 43 Restore from current exhibition

7.3.1.11 Commit

To make the changes in the next exhibition to go live immediately, just press the commit button located in the home page. All of the information in the next exhibition will be copied to the current exhibition and the old information will be placed in backup. The changes are reflected instantly on the mobile device. Figure 44 illustrates the commit button.
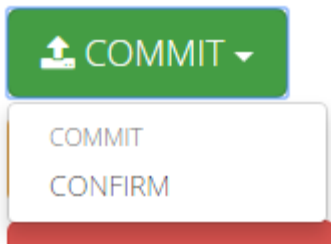
Figure 44 Make changes go live by clicking commit

7.3.1.12 Settings

This function allows users to edit information related to the exhibition. For example, they can change the floor plan, both English and Chinese titles, descriptions and the categories of exhibits of the exhibition. The exhibition settings page is shown in figure 45.
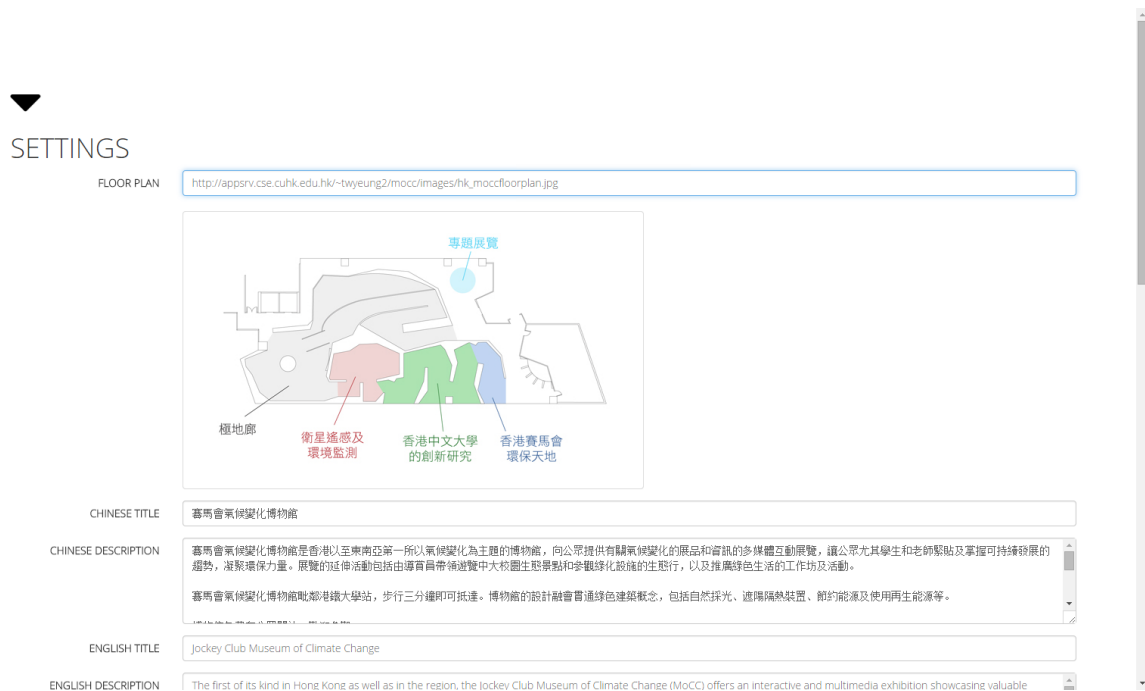
Figure 45 Settings page of the exhibition

7.3.1.13 Overview

The exhibition settings can be read in the overview page. It carries similar information to the preview page and is shown to the mobile app users as a summary of the exhibition. Figure 46 shows an example exhibition overview.
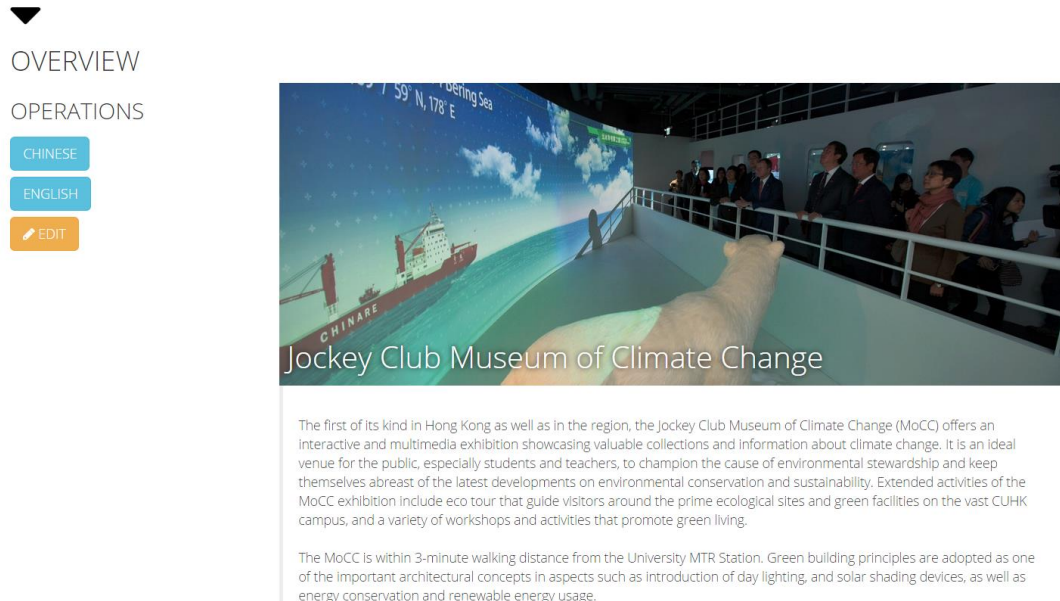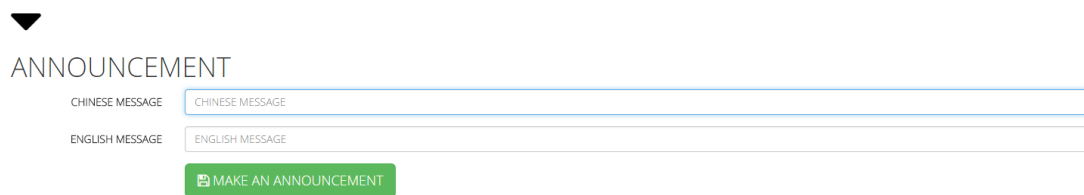
Figure 46 Quick view of the museum

7.3.1.14 Announcement

Exhibition owners can make announcements using the CMS. Simply click on the announcement button and enter the English and Chinese message. The announcement will be broadcasted to all visitors' phone in real time. Visitors can easily be notified of the closing time and scheduled activities of the exhibition. Figure 47 shows the announcement page.

Figure 47 Interface of making an announcement

7.3.2 API

We continued our work on the API that allows users to retrieve and edit information in their beacon database. This semester, we have added multiple functions. The API will continue using the same format of return data and methods of function calls in order not to affect current applications.

The major purpose of the new APIs is to facilitate the new app features. For example, API for authentication of users and setting of beacon ID are implemented for the deployment tool. On the other hand, APIs are added for users to give rating and comments on the exhibits from the Radar app.

7.3.3 Mobile application for visitors

We have completely redesigned our application to improve user experience.

7.3.3.1 Navigation drawer

Similar to most of the applications developed by Google, for example Play Store, Hangouts and YouTube, our application provides a navigation drawer to allow quick and intuitive access to most parts of the application. By dragging from the left edge to the right of the phone, the navigation drawer shows up. The drawer contains 4 buttons - Overview, Content, Settings and About. The navigation drawer is shown in figure 48.
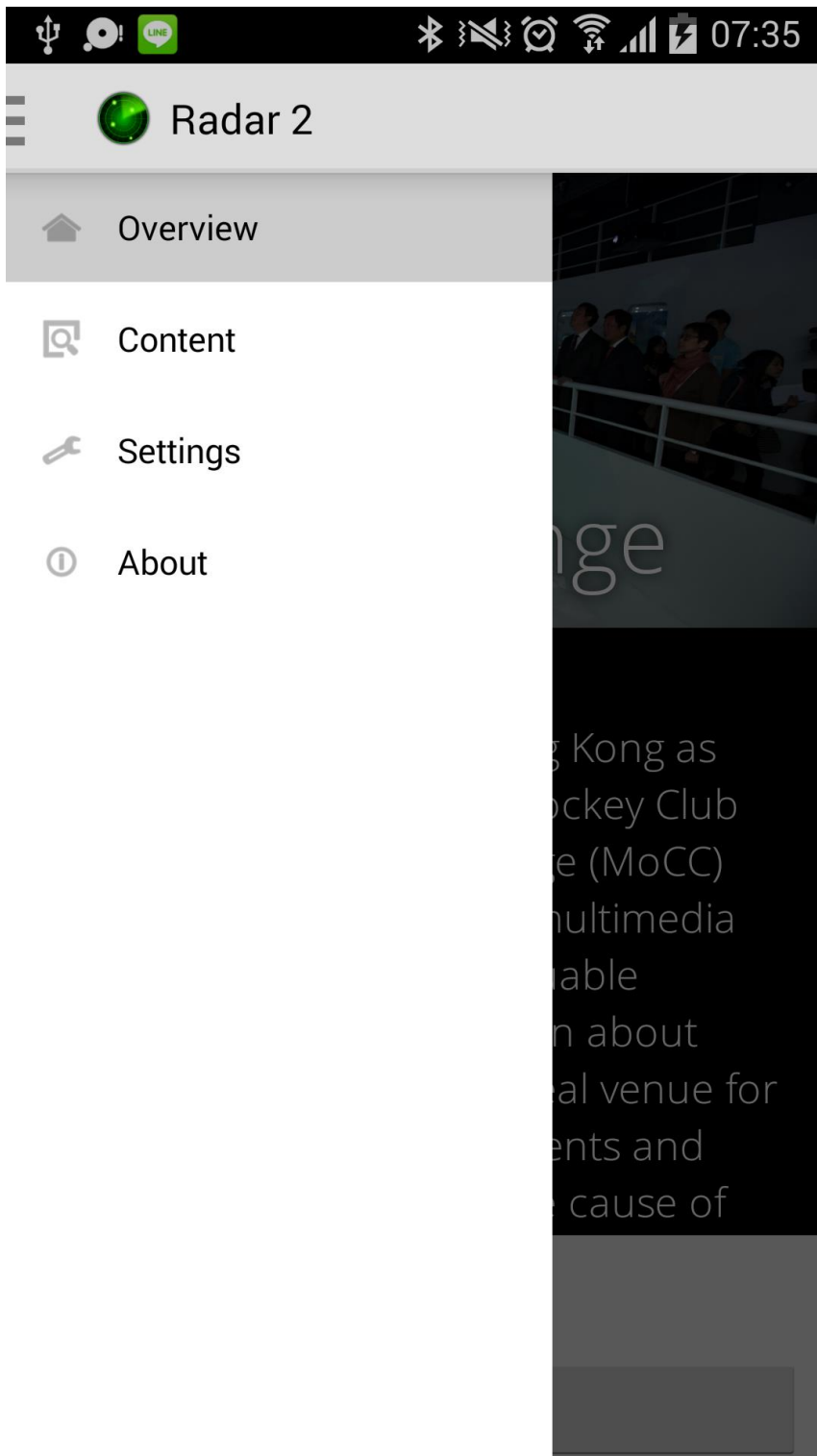
Figure 48 Navigation drawer

7.3.3.1.1 Overview button

The first button shows users the exhibition overview page. They can see the background information of the exhibition including the names, descriptions and cover photo of it. This page is automatically loaded when a user enters the exhibition. Users can always return to this page by swiping their mobile devices from the left edge of the screen and pressing the top Overview button.

7.3.3.1.2 Content button

The second button - Content, shows the details of an exhibit. This page displays the cover photos of the exhibit, its title, the description in either Chinese or English, its rating and comments. If the user has moved onto another exhibit, a button will show up at the bottom of the screen while its title printed on the button. Users can choose to ignore the notification and continue on this page or go on to the next exhibit by tapping on the button. Figure 51 shows the "next exhibit" notification button.
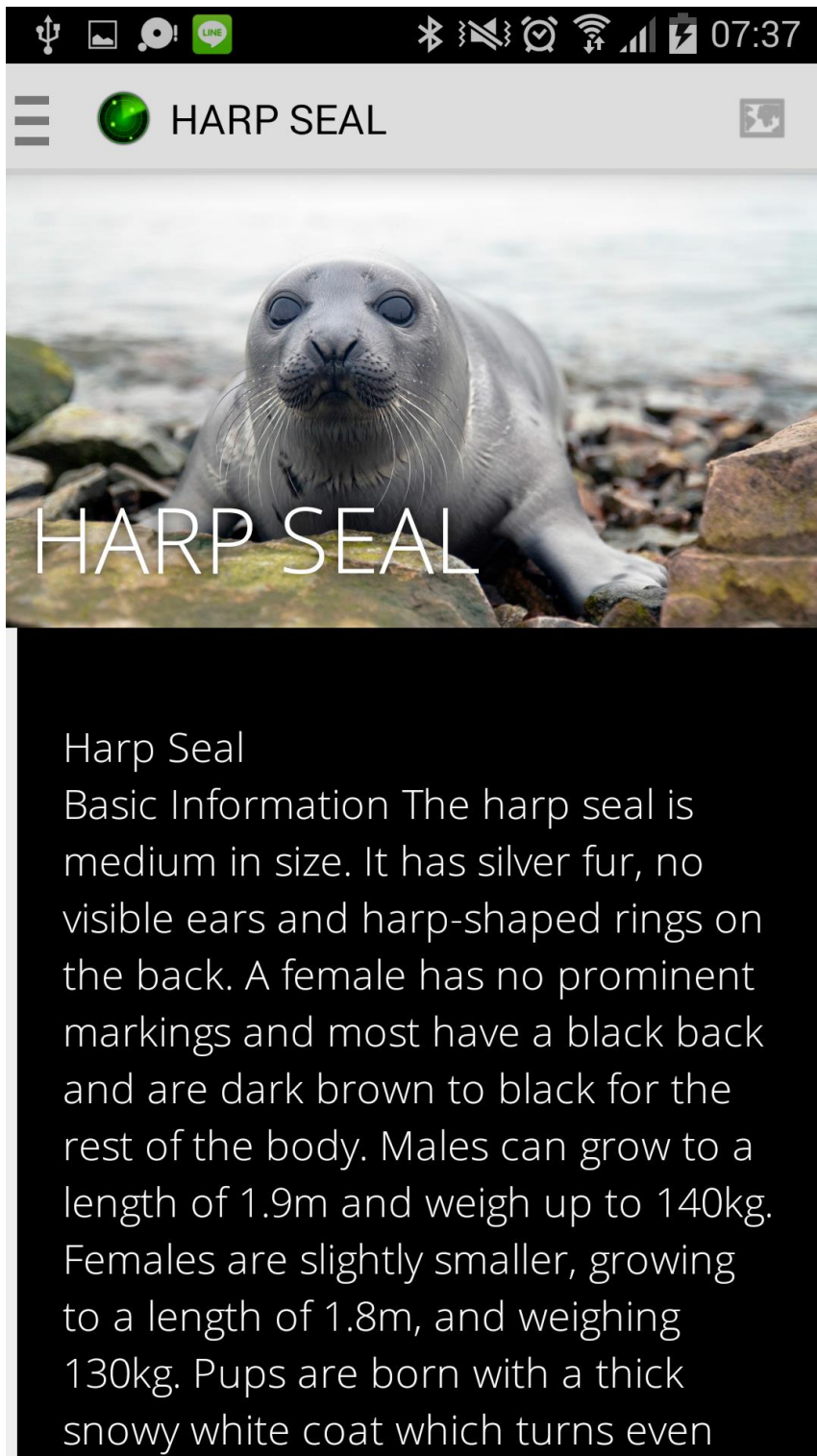
Figure 49 Exhibition details in Content page

7.3.3.1.3 Settings button

Tapping on this button brings users to the settings page of this application. Users can allow auto playing of audio and choose their language here. Figure 50 shows the settings page.

7.3.3.1.3.1 Auto Play Audio

Turning this feature on will play the audio navigation automatically once the Content page is loaded. If users turn this feature off, no audio will be played until the user hits the "Play" icon.

7.3.3.1.3.2 Language

Hong Kong is an international city and most exhibitions display their exhibits in both English and Chinese. Therefore, our application supports displaying descriptions and titles and our application interface languages in both languages. The multilingual support of the application is demonstrated in figure 51.

Figure 50 Settings page

豎琴海豹

豎琴海豹
基本資料 豎琴海豹是中型的無耳海豹·銀色
毛皮，背上 有豎琴形環紋。 雌性的環紋較
不明顯·背部多 為黑色，其他身體部位淺
至深褐色，深至黑色 。 雄性身長可達1.9
米·體重可達140公斤；雌 性體型略小·身
長可達1.8米，體重可達130公 斤。 豎琴
海豹幼患出生時毛皮厚實雪白·出生 後兩周
內會變得更白。但兩周後·這層毛皮會 開

繼續參觀…

北極熊
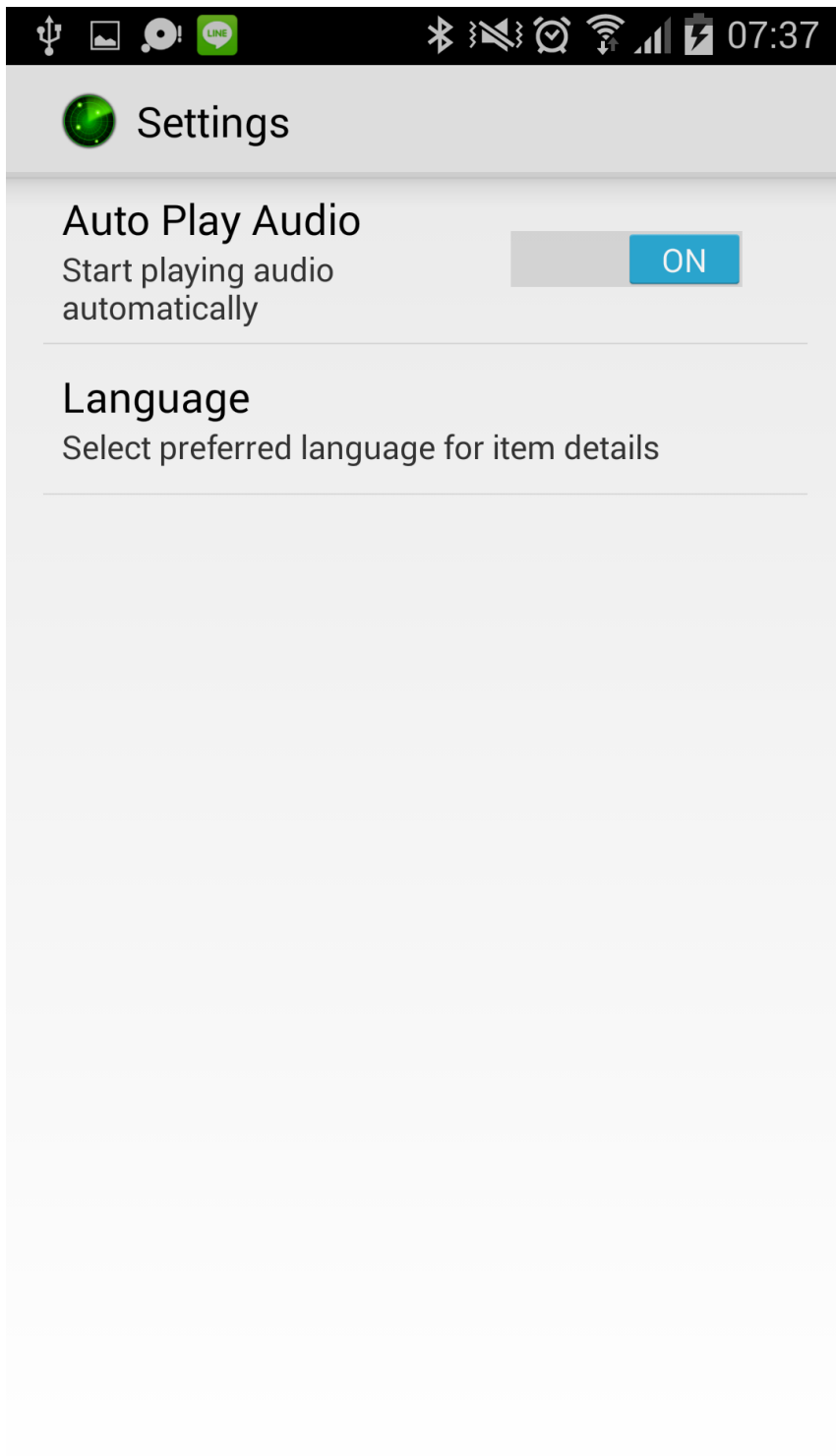
Figure 51 Multilingual support and the "next exhibit" popup

7.3.3.1.4 About button

The last button shows the software information, including software version, build number, authors and copyright information.

7.3.3.1.5 Real-time notifications

One of the major and new features in this version of Radar is showing real-time notifications to users. Simply open the application and your device is automatically registered to our push notification central - no other settings are required. The notification feature is demonstrated in figure 52. Two example uses of the notification feature is discussed below.

7.3.3.1.5.1 Fire alert

In case of emergencies, for example, a fire breaks out at the museum, a notification is can be broadcasted to all mobile devices alerting all users to evacuate at once. This ensures users are aware of the fire alarm even they are having their headphones on listening our guided tours. A loud ringtone is played and an alert message is read out loudly to remind users to leave the museum. If other sounds, for example, music or guided tours audios, are being played at the moment, all sounds would be paused to play the fire alert. A help button will also pop up to let users to request help. Visitors can also enter a message while requesting for help. Their locations will be sent to the mobile devices of all staff and exhibition owners to ensure help is provided at once.

At the last 15 minutes of the opening hours of the museum, a notification will pop up

to remind users its opening hours. When the museum is closed, another notification

would request to leave the museum and a survey will pop up to provide their

feedback on the museum.
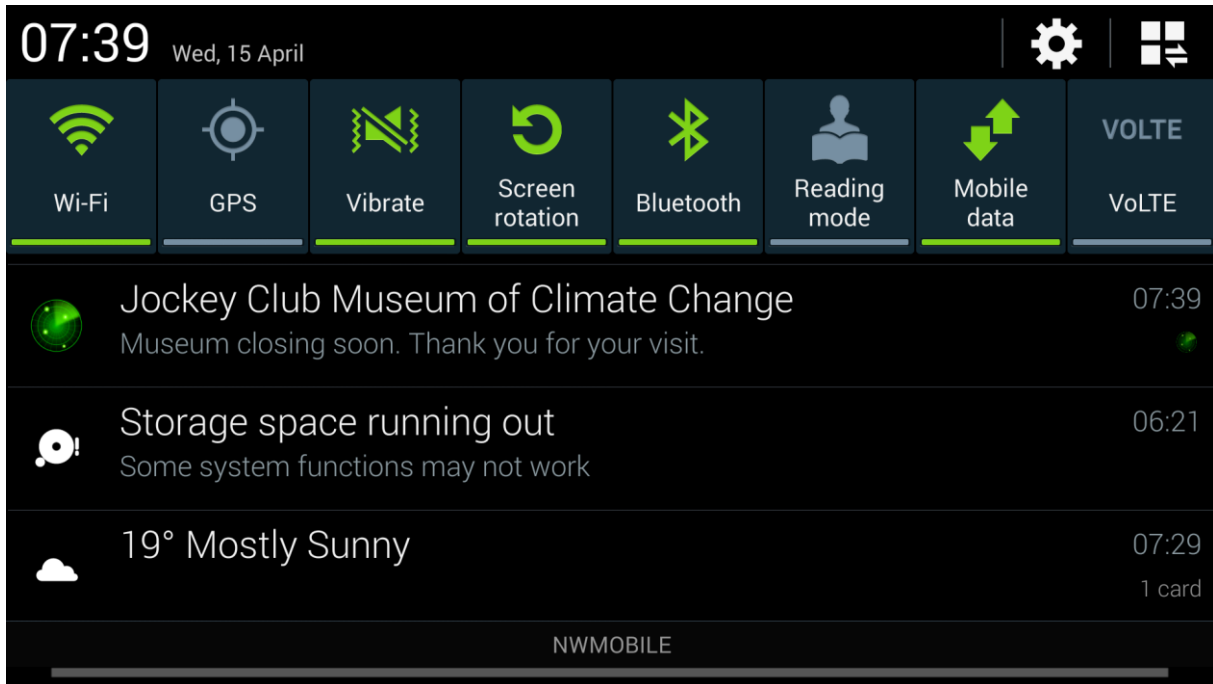
Figure 52 Example alert

7.3.4 Mobile application for exhibition owners

We have built a beacon deployment tool for exhibition owners. The goal of the tool is to simplify entering of UUID, major and minor of the beacon. The information will automatically be synced with the beacon database. Furthermore, exhibitors can use the application to enter the compass bearing range which corresponds to the exhibit. Entering the range in the real exhibition environment works as a calibration and ensure accurate detection of exhibits. The application is divided in 4 parts - login screen (main screen), Exhibition item list, item settings and about.

7.3.4.1 Login screen

Users must first have an account on our system. Account creation through the mobile application is not possible. We have made this limitation because we believe we take jobs from each client individually and each client has unique exhibitions. We have to make customizations for each exhibition to better suit each exhibition's needs. As a result, we do not allow arbitrary users to use our system by registering accounts by their own. If the login fails, a short message will pop up to notify users to amend their login details. Figure 53 shows the login screen of Radar Tools.
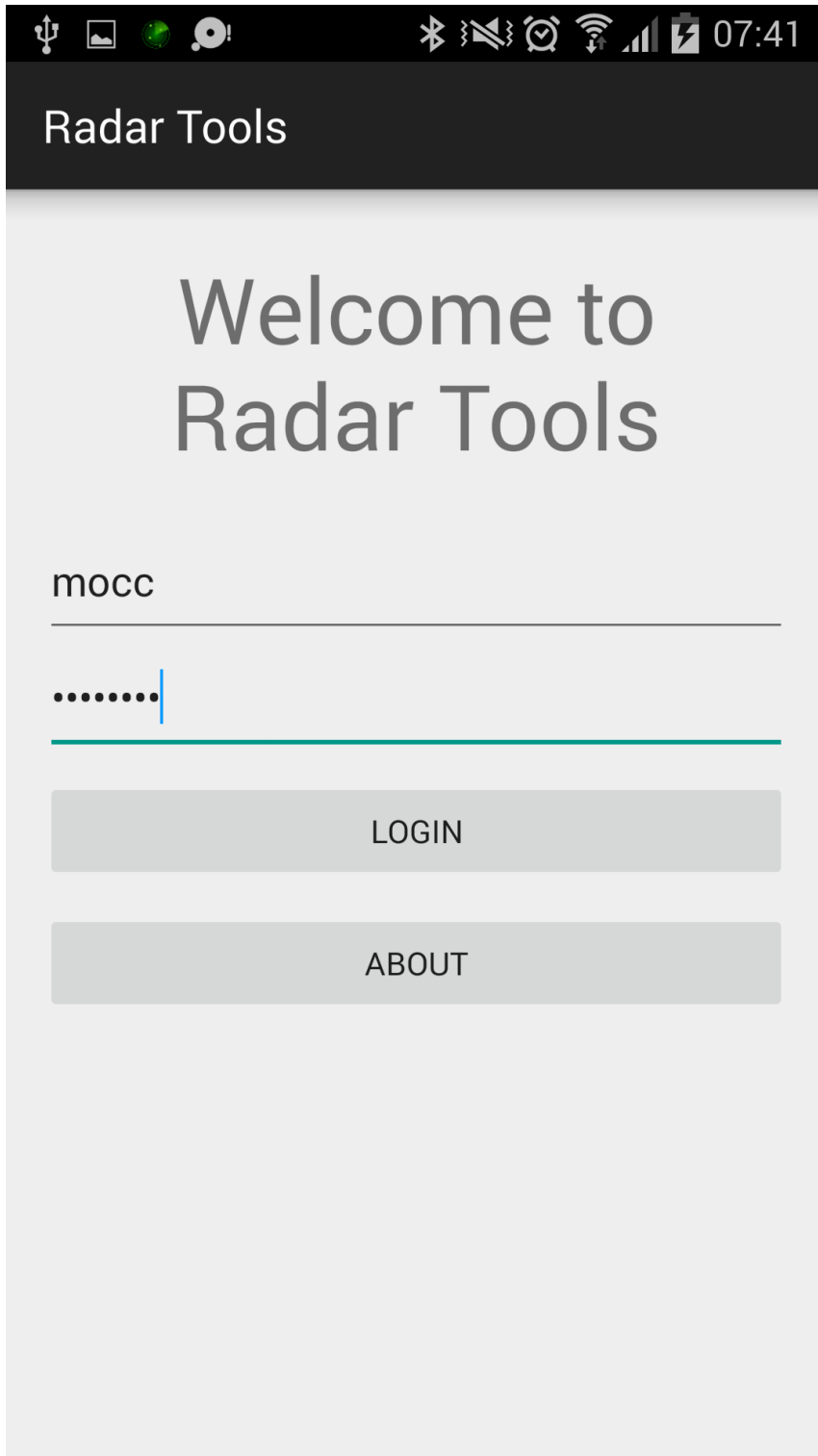
Figure 53 Login screen

7.3.4.2 Exhibition item list

After logging in, users can see a list of exhibits that they own, as shown in figure 54. The list shows the titles of the exhibits. By tapping on any of the list item on the exhibit list, user will be brought to the setting screen of that exhibit. Some of the list items have a mark of "(Completed)" next to them. It indicates that exhibit has completed all settings - UUID, Major, Minor and compass bearing range.
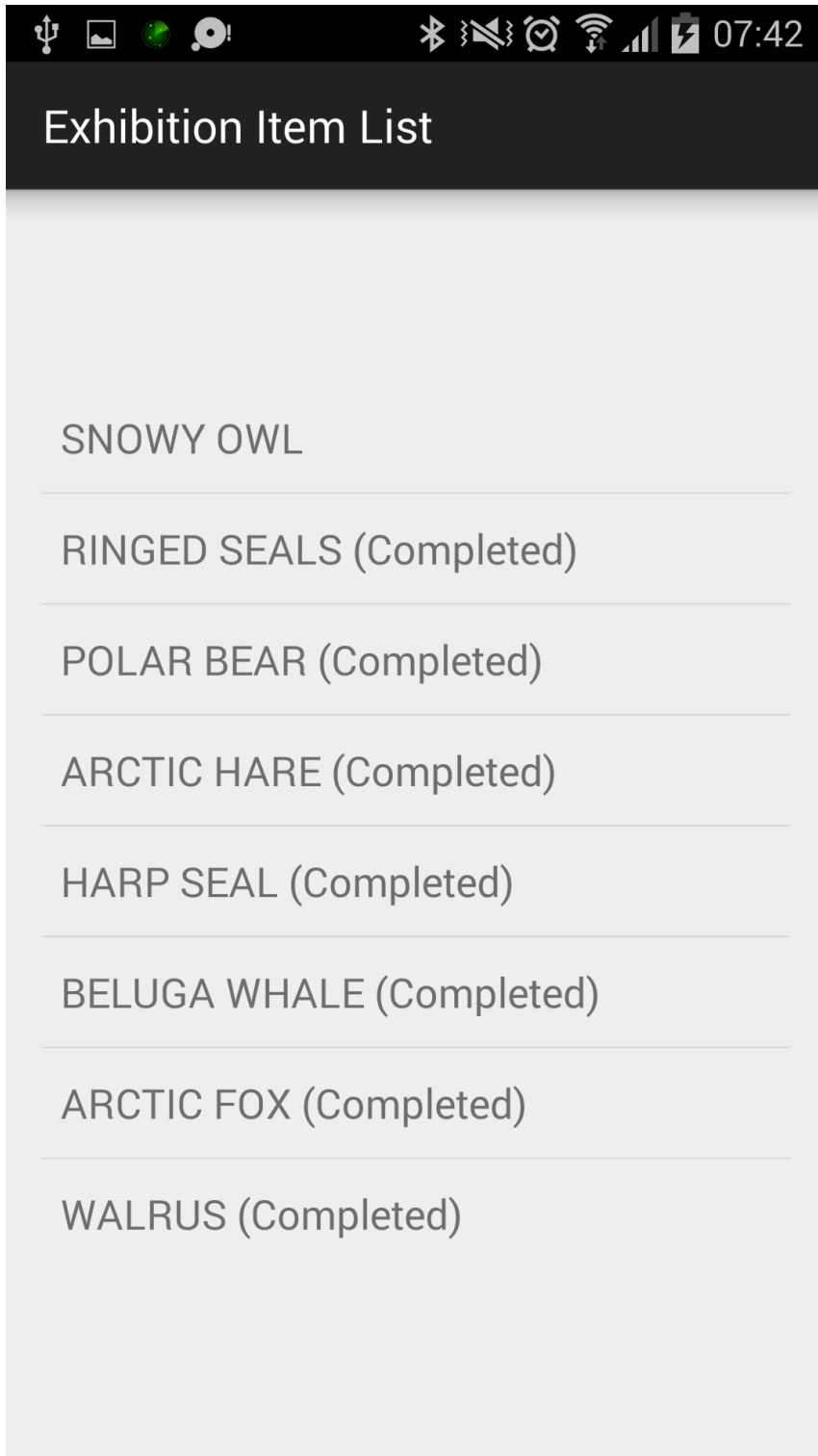
Figure 54 Exhibition item list

7.3.4.3 Item settings

In the item settings screen shown in figure 55, users can associate a beacon to an exhibit. Simply turning on Bluetooth and placing the beacon near to the phone, then tap "Set Beacon ID". The exhibit will be associated with the beacon. They can also set left and right bearing if they associate more than one exhibit to a single beacon by rotating their phone, then press "Set Right Bearing" and "Set Left Bearing". After that, just hit "Save" to push all data to the database. The changes will be saved in the "Next exhibition" section of the CMS, and reflected in the user application upon next commit.

7.3.4.4 About

The about button located on the login screen brings users to information on the app, including software version, build number, authors and copyright information.

RINGED SEALS Settings

Beacon Settings

UUID   407F30F5F8466EAFF925556B57FE6D

Major 26846

Minor 36763

Angle 9 to 155

SET BEACON ID

SET RIGHT BEARING

SET LEFT BEARING

SAVE SETTINGS
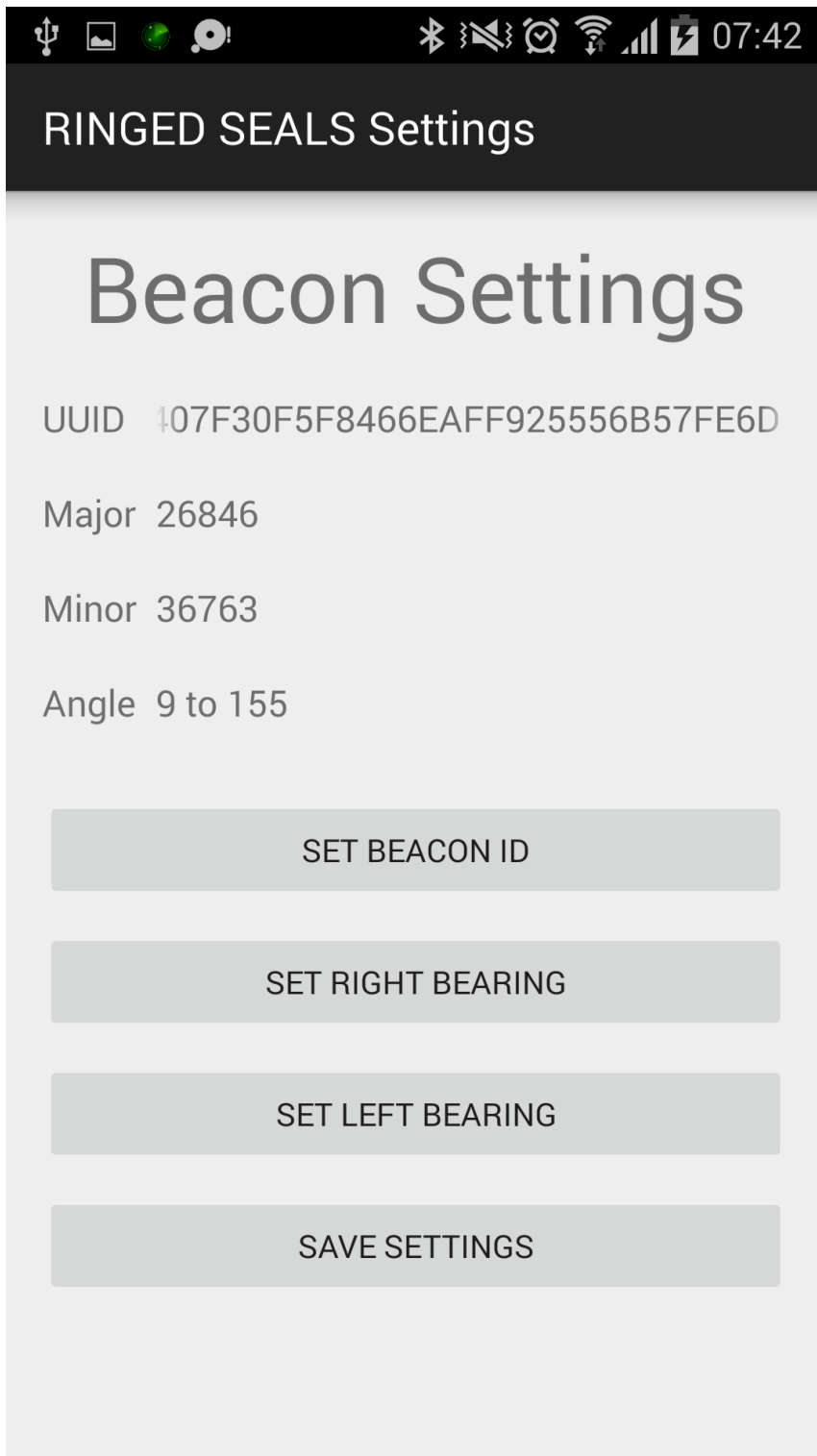
Figure 55 Settings screen

8 Deployment of the system in real case scenarios

8.1 Jockey Club Museum of Climate Change

We have created a CMS specifically for the Jockey Club Museum of Climate Change. The CMS divides the museum into multiple sections - each section contains different exhibits. The preview page of each exhibit shows the title, description and images of it. In the main page of the CMS, all beacons that are registered are displayed at a glance. Users can also modify each beacon and the exhibition by clicking on each beacon and the left sidebar respectively. By proceeding to the backup section and the next exhibition section, users can restore the old data to the current exhibition. Users can prepare for the next exhibition beforehand too - simply go to the next exhibition and add or edit beacons. Once the user is satisfied with the data, they can just click 'Commit' to push all the data to the current exhibition and all changes will go live immediately. All changes can be reflected on all mobile devices at once by rescanning for beacons and no restart of the application is required.

8.2 HKTDC International ICT Expo 2015

From 13th April to 16th April, we showed off our CMS at the International ICT Expo 2015 at HKCEC. The CMS attracted a lot of attention from the public and people are very interested in the principal behind the relationship of beacon deployment and the real-time update of data and the push notifications. The general public is very excited in this product. Also, we have received a lot of valuable feedback from the public. For example, the responsive design for mobile devices and the deployment scheme of beacons. After the exhibition at the ICT Expo, we modified our CMS based on the comment provide by the public and professionals. As a result, we have improved the CMS and the beacon deployment scheme and this modifies version becomes our final product. Figure 56 to 59 show the iBeacon section in the expo.
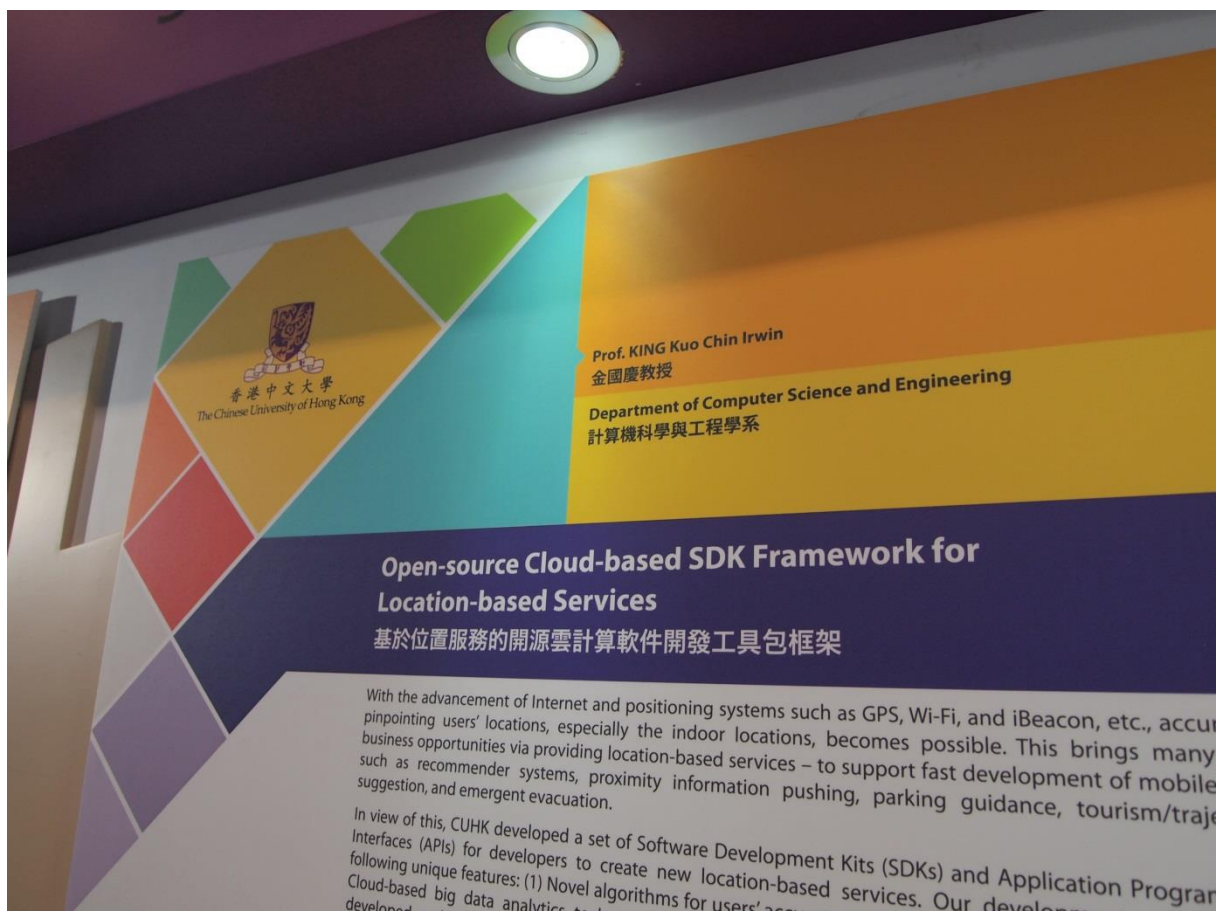
Figure 56 Exhibition at HKCEC

Figure 57 Exhibition at HKCEC
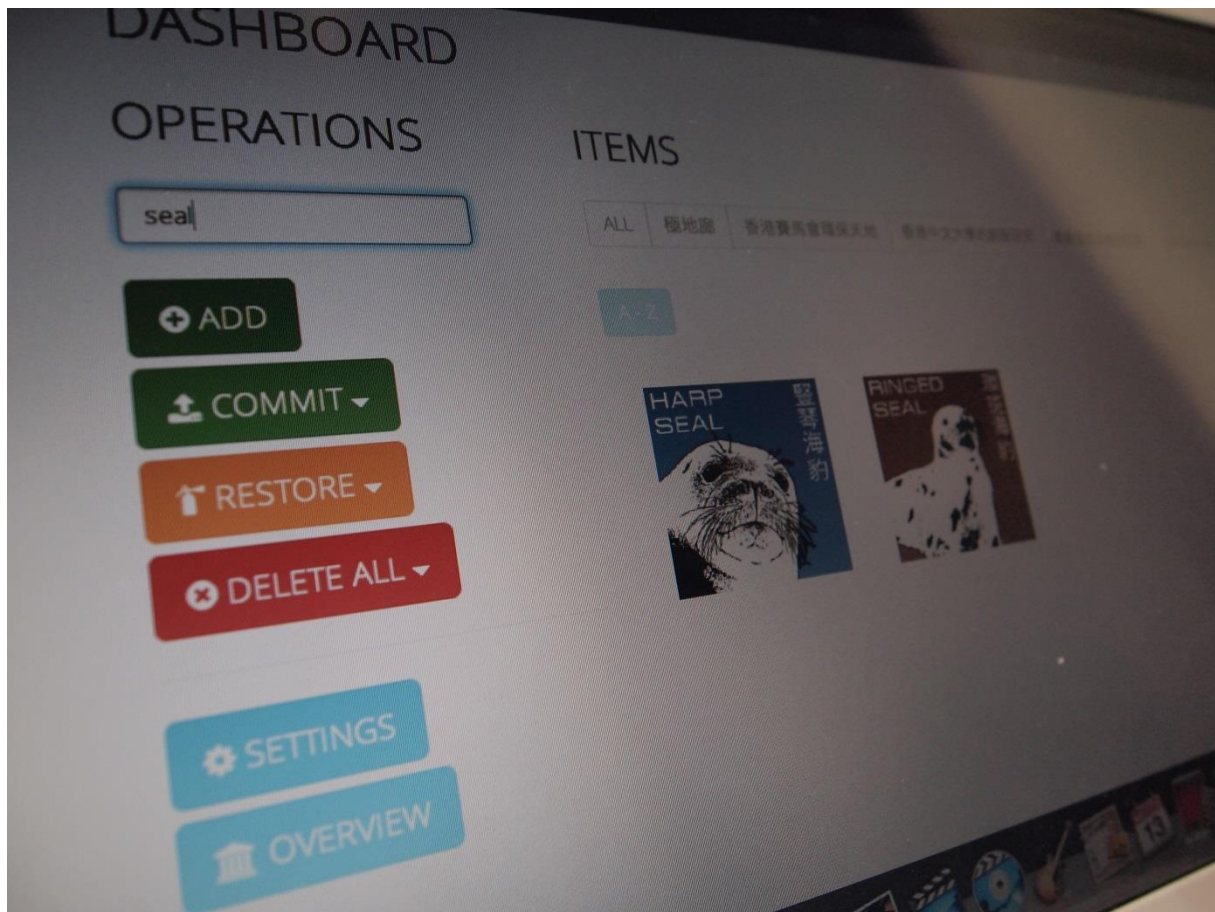
Figure 58 Exhibition at HKCEC

Figure 59 Exhibition at HKCEC

8.3 SHB Reading Room on 6/F

At the beginning of this semester, we conducted an investigation on the beacon deployment scheme on the 6/F Reading Room of the Engineering Building. We have found out that the ceiling on the east side is far lower than the west side of the room, as shown in figure 60 and 61. According to the results of our experiment last semester, the distance of beacons and the scanner greatly affects the accuracy of the distance calculated - distance greater than 4 meters would be undeterminable. Therefore, it is not feasible to deploy beacons on the ceiling of the higher side. However, it is possible to deploy beacons densely on the lower side. After discussions, we have made up a plan to overcome these difficulties - dense deployment on the east and sparse deployment on the west. We suggest that a more accurate location can be determined on the east while we should use beacons only for simple information display and analytics on the west.

Figure 60 West side of Reading Room

Figure 61 East side of Reading Room

9 Limitations

We have found numerous limitations on the use of iBeacons for indoor exhibitions.

9.1 No background scans

As mentioned above, Bluetooth scans drain battery. We have come up with two possible solutions to the battery drain; however, the solutions are palliative. The first one is to reduce the scan frequency in the background. Yet, reducing the scan frequency implies a huge reduction in the accuracy in location determination - we can imagine the situation would be like locating through WiFi. The second solution is to scan on demand. The application will only scan when the user manually requests the application to scan for beacons nearby. However, this application, as an exhibition navigation system, targets the general public, not Bluetooth developers. Therefore, we have to make the application as easy to use as possible. We have to minimize the number of commands and encapsulate all technical details to keep everything user-friendly. Thus, we will not add any 'manual scan' buttons to the user interface.

As a result, these two solutions have been turned down by our team. Beacons will be scanned only when the application is in foreground.

9.2 Beacon Distances, Noises and Interferences

The quality of scanning largely depends on the signals emitted by the beacons. After our investigation on the waves emitted by the beacons, there are huge differences in the accuracy of location estimation of different methods of beacons deployment.

9.3 Floor and ceiling, neither good

9.3.1 Not to be deployed on the floor

From the experiments above, we have found that concrete, wooden and turf both absorb signals emitted by Bluetooth beacons. The received RSSI (signal power level) by mobile phones drastically decreases and the estimate distance from the beacon would be further than expected.

9.3.2 Not to be deployed on ceilings

One location that we have placed beacons onto is the lamp shield. However, lamp shields are made of metal and are in cylindrical shapes. Metals reflect beacon signals so well that multiple signals are apparently produced from one source, causing interferences of signals. This might result in amplification of signals and received power will be inaccurate.

9.3.3 Neither too close, nor too far

9.3.3.1 Too close

As beacons are often deployed on walls or ceilings, placing the phone near the beacon (and hence near walls or ceilings) causes unwanted errors. The errors are induced by the reflections by walls and ceilings and two identical waves may be produced by the reflection, causing undesirable scan results.

9.3.3.2 Too far

According to one of the specification pages of the AltBeacon library, the accuracy of beacons that are far away is far lower than nearby beacons - a beacon that is 20 meters away may result in an estimation of distance between 10 to 40 metres [28]. The error happens when there are large objects blocking the waves emitted by the beacon or wave amplitude amplified by smooth surfaces, like walls.

9.3.4 Background noises

Though BLE implements frequency hopping to prevent interferences with other bands used by other devices, there is a possibility of having a very short time that two devices are using the same frequency. This might happen when two Bluetooth devices are turned on at exactly the same time and they emit waves at the same frequency or the devices are turned on at different times and emit waves at two distinct frequencies. Both situations cause two devices fighting to use the same band at the same instance and cause interferences.

9.3.5 More is less

Deploying more beacons does not always imply we get more accurate results - we still have to deploy them in suitable distances. Placing two beacons too close causes interferences and reduces accuracy.

9.3.6 Not on the same wavelength

When the frequency of the scan is different from the emission frequency, there is a possibility that at some time the phone cannot find any beacon. If we still take this failed scan result in approximating the distance, this odd value largely affects the moving distance estimated by the phone, and hence, affects the scan accuracy. The good news is the emission frequency by the beacon can be adjusted manually to match the frequency of the scanning device.

9.3.7 Different scanning devices

Let us take Android as an example here. We see a great diversity of specifications in various Android devices - they have very different screen resolutions, memories, processing power and Bluetooth antennas. The huge difference in hardwares of Android devices makes the signal strength detected versus the actual distance to the beacon a huge discrepancy between devices. Not to mention the material of the casing of the phone affects the detected signal strength, the diverse of types of devices make calibration of the phones a huge work to the deployment project. Currently, the only solution for more accurate results is to test the beacons with different phones in different distances with different beacons and determine a formula for finding the distance for that phone.

9.3.8 Publicly available IDs

We can think of beacons are simply Bluetooth devices or WiFi access points - their names are visible to everyone, no authentication is required to read these information, nor these information is encrypted. Bad guys can scan for the UUIDs, majors and minor of the beacons and replicate these values to his own beacons to trick your customers believing they are in the right location. The consequence might lead to an increase of server load if you pull data from the database every time you scan for a beacon, or, more seriously, creates loss to the company if you distribute gifts coupons through on the detection of beacons. There is currently no solution to this kind of attack and we suggest that beacons should not be used in processing sensitive information like personal details.

9.3.9 Beacon signals blocked by human

We have recently discovered that there is one more limitation when using beacons as a method of exhibition navigation - signals are blocked by visitors. As Bluetooth signals can be effectively blocked by water, and human body is mostly made up of water, signals would be blocked definitely. To prevent inaccuracy of distance calculated by mobile devices, try deploying beacons above the height of people - at 162cm, according to WolframAlpha.

10 Schedule of work

Table 6 and 7 show the timeline of our work on this project.

Work / Time	May '14	Jun	Jul	Aug	Sep	Oct	Nov
Bluetooth investigation	■	■					
Scope Decision		■					
Android Investigation		■	■				
Beacon technologies investigation		■	■				
Ordering beacons		■	■				
Android application prototype				■			
1st Web CMS deployment					■	■	
Experiment for beacon deployment						■	■
1st Android deployment application						■	■
1st Android exhibition application						■	■
API draft							■

Table 6 Work schedule in semester 1

Work / Time	Dec '14	Jan '15	Feb	Mar	Apr
Scope refinement					
2nd Android exhibition application					
2nd Android deployment application					
Field trip to real case deployment venues					
Real case deployment					
Complete redesign of CMS					
API refinement					
Review of all work					

Table 7 Work schedule in semester 2

11 Future works

In the previous semester, we have planned to make a multiple user CMS, extend our API and improve our method of position determination. This semester, we have completed all our plans and over fulfilled all our works. We have also built a beacon deployment tool, an analytics system for collecting data for future use, for example, big data analysis, collaborated with the Museum of Climate Change to use our system in real case scenarios, and responded public enquiries and showcasing our system by participating in the International ICT Expo 2015.

It is suggested to further improve our system in the future. The CMS shall support automatic commits. It may also provide further analysis on the data collected from users.

On the mobile side, currently, our mobile application works on Android only and we hope to extend our system to iOS. However, there are a lot more restrictions on the iOS platform when developing BLE applications. It is estimated that the difficulty of development and time required for development would both increase dramatically. Nonetheless, it is suggested to provide an iOS version of the application to satisfy the large iOS userbase.

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13 Reflections

The project on iBeacon has offered me a precious opportunity to explore cutting-edge technologies in the IT industry. Over the course of the project, I have gained exposure to different uses of beacons and many web services related to web services, which inspired me a lot.

There are four issues that I would like to share. First, on cooperation. The two-person setting of the project has offered me great experience in cooperation. It is enjoyable to work in a group which each member has different specializations and strengths. I must admit that I am a poor UI designer and always feel annoyed by Android layout or CSS, but is fine with complicated algorithms and program logic. Thankfully, Ng, my project partner, is an expert in the field. Specialization has saved both of us a lot of time.

Second, on information bloom. Having grown up in the information age, I do not mind seeing a lot of information, even if the amount is too huge for human to process. In the past, I usually try to fill as much information on the UI and provide as much feature as I can think of. While talking to different users, I learnt that this might not be what they want. An overflowing amount of information distracts users, especially the older ones. In my future projects, the most important information shall be cherry-picked to present to users.

Third, on software requirement. After some testing on our exhibition app, it is found that the beacon signal fluctuates quickly, causing the displayed information to bounce between exhibition items. Eventually we have decided to give up the 'fully automatic' navigation, and instead require the user to tap a button to confirm switching to one or

two items suggested by the software. Given the limitations of the technologies, there are tradeoffs that we have to make.

Lastly, on spread of new technology. The impression that iBeacon gives me is that, its effect is exaggerated by most. As an indoor navigation tool, it suffers from signal fluctuations and thus low accuracy. As a proximity sensor, it requires users to turn on the Bluetooth capability on phone manually. Over the year, we have seen different example use cases of iBeacon. Yet, most of them are experimental, with countable number of large-scale beacon deployment worldwide. It is going to take both OS vendors and hardware manufacturers some more time to further ease the use of beacons before it can draw the attention of governments and corporations.

Overall, the project is enjoyable and insightful. It has allowed me to utilize my strength and further identify my weaknesses. It is also an honour to have part of our project shown in International ICT Expo 2015.

14 Acknowledgement

Our group would like to show our deepest gratitude to the project supervisor, Professor Michael Lyu for providing valuable suggestions and encouragement on our research project to make sure everything goes well. We would also like to thank Professor Irwin King for guidance in developing the open source indoor location system, which provides inspirations for our direction this term. Last but not least, we would also like to thank Mr Edward Yau and Mr Tsz Lung Un of the ViewLab for their opinions and help on the project. This project is not made possible without their advice.

15 Appendix

15.1 Implementation

Below shows part of our source codes of the whole beacon system for exhibition navigation.

15.1.1　　　Web

15.1.1.1 CMS

add.php

```php
<?php
    // check login status
    session_start();
    if (!isset($_SESSION['id'])) {
        // redirect to login.php
        $host = $_SERVER['HTTP_HOST'];
        $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
        header("Location: http://$host$uri/login.php");
    }

    // handle submission: add to item_next
    if (isset($_REQUEST['submit'])) {
        $con = new mysqli("","","","");
        if (mysqli_connect_errno()) {
            echo "Failed to connect to MySQL: " .
mysqli_connect_error();
        }
        $con->query("SET NAMES utf8");

        $stmt = $con->prepare("INSERT INTO lyu1403_cms_item_next
(user, uuid, major, minor, angle1, angle2, locationX, locationY,
category, title, titleTC, description, descriptionTC, photos, audio,
video, youtube, audioTC, videoTC, youtubeTC) VALUES
(?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?)");
        $stmt->bind_param("ssiiiiiissssssssssss",
$_SESSION["id"], $_REQUEST["uuid"], $_REQUEST["major"],
$_REQUEST["minor"], $_REQUEST["angle1"], $_REQUEST["angle2"],
$_REQUEST["locationX"], $_REQUEST["locationY"],
$_REQUEST["category"], $_REQUEST["title"], $_REQUEST["titleTC"],
$_REQUEST["description"], $_REQUEST["descriptionTC"],
$_REQUEST["photos"], $_REQUEST["audio"], $_REQUEST["video"],
$_REQUEST["youtube"], $_REQUEST["audioTC"], $_REQUEST["videoTC"],
$_REQUEST["youtubeTC"]);
        $stmt->execute();

        // redirect to dump_next.php
        $host = $_SERVER['HTTP_HOST'];
        $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
        header("Location: http://$host$uri/dump_next.php");
    }

    // load exhibition info
    $con = new mysqli("","","","");
    if (mysqli_connect_errno()) {
```

```php
            echo "Failed to connect to MySQL: " .
mysqli_connect_error();
        }
        $con->query("SET NAMES utf8");

        $stmt = $con->prepare("SELECT floorplan_next FROM
lyu1403_cms_exhibition WHERE user = ?");
        $stmt->bind_param("s", $_SESSION['id']);
        $stmt->execute();
        $stmt->store_result();

        $status = 0;
        if ($stmt->num_rows != 0) {
            $stmt->bind_result($fp);
            $stmt->fetch();
        } else {
            $status = 1;
        }

        $categories = array();
        $stmt = $con->prepare("SELECT id, description FROM
lyu1403_cms_location WHERE user = ?");
        $stmt->bind_param("s", $_SESSION['id']);
        $stmt->execute();
        $stmt->store_result();
        $stmt->bind_result($a, $n);

        for ($i = 0; $i < $stmt->num_rows; $i++) {
            $stmt->fetch();
            $obj = array("abbr" => $a, "name" => $n);
            array_push($categories, $obj);
        }
?>
<!DOCTYPE html>
<html>
<head>
<title>ADD</title>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-
scale=1.0, maximum-scale=1.0, user-scalable=no" />
<script src="js/jquery-2.1.1.min.js"
type="text/javascript"></script>
<script src="js/bootstrap.min.js"></script>
<script src="js/isotope.pkgd.min.js"
type="text/javascript"></script>
<script src="js/jquery.colorbox-min.js"></script>
<script src="js/jquery.animsition.min.js"></script>
<script src="js/jquery.transit.min.js"></script>

<link rel="stylesheet" type="text/css"
href="css/bootstrap.min.css"></link>
<link rel="stylesheet" href="font-awesome-4.2.0/css/font-
awesome.min.css">
<link rel="stylesheet" type="text/css"
href="css/colorbox.css"></link>
<link rel="stylesheet" href="css/animsition.min.css">
```

```
<style>
      @font-face {
            font-family: Open Sans;
            src: url(fonts/OpenSans-Light.ttf);
      }

      * {
            font-family: Open Sans;
      }

      #closeButton {
            margin-top: 75px;
            color: #000000;
      }

      #closeButton:hover {
            color: #000000;
      }

      #closeButton:active {
            color: #000000;
      }

      .container-fluid {
            margin-left: 5%;
            margin-right: 5%;
      }

      .buffer-2-5 {
            padding-top: 2.5%;
      }

      .buffer-5 {
            padding-top: 5%;
      }

      .operations {
            background: #CCCCCC;
      }

      .btn-group {
            margin-top: 15px;
            margin-bottom: 15px;
      }

      .main {
            color: #FFFFFF;
            background: repeating-linear-gradient(
                  45deg,
                  #000000,
                  #000000 25px,
                  #FF6600 25px,
                  #FF6600 50px
            );
      }
```

```css
      .disabled {
            opacity: 0.2 !important;
      }

      #pin {
            display: none;
            position: absolute;
      }

      #floorplanOverlay {
            display: block;
            position: absolute;
            top: 0;
            left: 0;
      }

</style>

</head>
<body>

<div class="animsition">
<div class="container-fluid vertical-center">
<div class="row">
<div class="col-md-12">
      <a href="dump_next.php" class="animsition-link"><i
id="closeButton" class="fa fa-sort-desc fa-5x"></i></a>
      <h1>ADD</h1>
      <div class="buffer"></div>
</div>
</div>
<div class="row">
      <form class="form-horizontal" method="POST">
            <div class="form-group">
                  <label class="col-sm-2 control-label"
for="inputTitleTC">CHINESE TITLE</label>

                  <div class="col-sm-10">
                        <input class="form-control" id="inputTitleTC"
placeholder="CHINESE TITLE" type="text" name="titleTC" autofocus
required>
                  </div>
            </div>

            <div class="form-group">
                  <label class="col-sm-2 control-label"
for="inputTitle">ENGLISH TITLE</label>

                  <div class="col-sm-10">
                        <input class="form-control" id="inputTitle"
placeholder="ENGLISH TITLE" type="text" name="title" required>
                  </div>
            </div>

            <div class="form-group">
```

```
                <label class="col-sm-2 control-label"
for="inputLocationX">LOCATION</label>

                <div class="col-sm-5">
                        <input class="form-control"
id="inputLocationX" placeholder="" type="text" name="locationX"
readonly>
                </div>
                <div class="col-sm-5">
                        <input class="form-control"
id="inputLocationY" placeholder="" type="text" name="locationY"
readonly>
                </div>

                <div class="col-sm-offset-2 col-sm-10">
                <?php if ($status == 0) { ?>
                        <br><img id="floorplan" src="<?php echo
$fp ?>">
                        <img id="pin" src="img/pin.png">
                        <div id="floorplanOverlay"></div>
                <?php } else { ?>
                        <div class="alert alert-warning alert-
dismissible fade in" id="image-alert" role="alert">
                                <strong>Warning:</strong> The floor plan
has not been set yet. Please add it in <a
href="exhibition.php">exhibition settings page</a>.
                        </div>
                <?php } ?>
                </div>
        </div>

        <div class="form-group">
                <label class="col-sm-2 control-label"
for="inputLocation">CATEGORY</label>

                <div class="col-sm-10">
                        <?php if (count($categories) == 0) { ?>
                                <div class="alert alert-info alert-
dismissible fade in" id="image-alert" role="alert">
                                        <strong>Information:</strong> No
item categories has not been set yet. You may set them in <a
href="exhibition.php">exhibition settings page</a>.
                                </div>
                        <?php }?>
                        <select class="form-control" name="category">
                                <option value="">Select a
category</option>
                                <?php for ($i = 0; $i < count($categories);
$i++) { ?>
                                <option value="<?php echo
$categories[$i]['abbr']; ?>"><?php echo
$categories[$i]['name']; ?></option>
                                <?php } ?>
                        </select>
                </div>
        </div>
```

```
        <div class="form-group">
            <label class="col-sm-2 control-label"
for="inputUuid">UUID</label>

            <div class="col-sm-10">
                <input class="form-control" id="inputUuid"
placeholder="UUID" type="text" name="uuid">
            </div>
        </div>

        <div class="form-group">
            <label class="col-sm-2 control-label"
for="inputMajor">MAJOR</label>

            <div class="col-sm-10">
                <input class="form-control" id="inputMajor"
placeholder="MAJOR" type="number" name="major">
            </div>
        </div>

        <div class="form-group">
            <label class="col-sm-2 control-label"
for="inputMinor">MINOR</label>

            <div class="col-sm-10">
                <input class="form-control" id="inputMinor"
placeholder="MINOR" type="number" name="minor">
            </div>
        </div>

        <div class="form-group">
            <label class="col-sm-2 control-label"
for="inputAngle">COMPASS ANGLE</label>
            <div class="col-sm-5">
                <input class="form-control" id="inputAngle"
min="0" max="360" value="0" type="number" name="angle1">
            </div>
            <div class="col-sm-5">
                <input class="form-control" min="0" max="360"
value="360" type="number" name="angle2">
            </div>
        </div>

        <div class="form-group">
            <label class="col-sm-2 control-label"
for="inputPhotos">PHOTOS</label>

            <div class="col-sm-10">
                <div class="input-group">
                    <input class="form-control"
id="inputPhotos" placeholder="LINK TO A PHOTO" type="text">
                    <span class="input-group-btn">
                        <button type="button" id="add-btn"
class="btn btn-info"><i class="fa fa-plus"></i></button>
                    </span>
```

```html
                                </div>
                        </div>
                </div>

                <div id="photo-list">
                        <div class="form-group hidden" id="photo-template">
                                <div class="col-sm-offset-2 col-sm-10">
                                        <div class="row">
                                                <div class="col-sm-12">
                                                        <div class="input-group">
                                                                <input class="form-control photo-link" type="text" disabled>
                                                                <span class="input-group-btn">
                                                                        <button type="button" class="btn btn-danger remove-btn"><i class="fa fa-times"></i></button>
                                                                </span>
                                                        </div>
                                                </div>
                                                <br><img class="hidden photo-preview img-responsive img-thumbnail">
                                        </div>
                                </div>
                        </div>
                </div>
                <input class="form-control hidden" type="text" name="photos" id="photos">

                <div class="form-group">
                        <label class="col-sm-2 control-label" for="inputDescriptionTC">CHINESE DESCRIPTION</label>

                        <div class="col-sm-10">
                                <textarea class="form-control" id="inputDescriptionTC" placeholder="CHINESE DESCRIPTION" rows="5" name="descriptionTC"></textarea>
                        </div>
                </div>

                <div class="form-group">
                        <label class="col-sm-2 control-label" for="inputAudioTC">CHINESE AUDIO</label>

                        <div class="col-sm-10">
                                <input class="form-control" id="inputAudioTC" placeholder="LINK TO AN AUDIO CLIP" type="text" name="audioTC">
                        </div>
                </div>

                <div class="form-group">
                        <label class="col-sm-2 control-label" for="inputVideoTC">CHINESE VIDEO</label>

                        <div class="col-sm-10">
                                <input class="form-control" id="inputVideoTC"
```

```
placeholder="LINK TO A VIDEO CLIP" type="text" name="videoTC">
                </div>
            </div>

            <div class="form-group">
                <label class="col-sm-2 control-label"
for="inputYoutubeTC">CHINESE YOUTUBE</label>

                <div class="col-sm-10">
                    <input class="form-control"
id="inputYoutubeTC" placeholder="LINK TO A YOUTUBE VIDEO"
type="text">
                    <div class="alert alert-warning alert-
dismissible fade in hidden" id="yt-tc-alert" role="alert">
                        <strong>Error:</strong> The YouTube link
cannot be recognized.
                    </div>

                    <input class="form-control hidden" type="text"
name="youtubeTC" id="youtubeTC">
                </div>
            </div>

            <div class="form-group">
                <label class="col-sm-2 control-label"
for="inputDescription">ENGLISH DESCRIPTION</label>

                <div class="col-sm-10">
                    <textarea class="form-control"
id="inputDescription" placeholder="ENGLISH DESCRIPTION" rows="5"
name="description"></textarea>
                </div>
            </div>

            <div class="form-group">
                <label class="col-sm-2 control-label"
for="inputAudio">ENGLISH AUDIO</label>

                <div class="col-sm-10">
                    <input class="form-control" id="inputAudio"
placeholder="LINK TO AN AUDIO CLIP" type="text" name="audio">
                </div>
            </div>

            <div class="form-group">
                <label class="col-sm-2 control-label"
for="inputVideo">ENGLISH VIDEO</label>

                <div class="col-sm-10">
                    <input class="form-control" id="inputVideo"
placeholder="LINK TO A VIDEO CLIP" type="text" name="video">
                </div>
            </div>

            <div class="form-group">
                <label class="col-sm-2 control-label"
```

```
for="inputYoutube">ENGLISH YOUTUBE</label>

                <div class="col-sm-10">
                      <input class="form-control" id="inputYoutube"
placeholder="LINK TO A YOUTUBE VIDEO" type="text">
                      <div class="alert alert-warning alert-
dismissible fade in hidden" id="yt-alert" role="alert">
                            <strong>Error:</strong> The YouTube link
cannot be recognized.
                      </div>

                      <input class="form-control hidden" type="text"
name="youtube" id="youtube">
                </div>
        </div>

        <div class="form-group">
                <div class="col-sm-offset-2 col-sm-10">
                      <button class="btn btn-success btn-lg"
type="submit" name="submit">
                            <i class="fa fa-floppy-o"></i>
                            SAVE
                      </button>
                </div>
        </div>
    </form>

</div>
<div class="buffer-5"></div>

</div>
</div>
<script>
    function addPhoto(url) {
          var ele = $("#photo-
template").clone(true).removeClass("hidden").attr("id", "");
          ele.find(".photo-link").val(url);
          ele.appendTo("#photo-list");

          // check existence of image
          var tmpImg = new Image();
          tmpImg.onload = function() {
                ele.find("img")
                      .attr("src", url)
                      .removeClass("hidden");
          };
          tmpImg.src = url;
    }

    // YouTube link recognizer from
http://stackoverflow.com/a/8260383
    function youtube_parse(url){
          var regExp =
/^.*((youtu.be\/)|(v\/)|(\/u\/\w\/)|(embed\/)|(watch\?))\??v?=?([^#\
&\?]*).*/;
          var match = url.match(regExp);
```

```
                if (match&&match[7].length==11) {
                        return match[7];
                } else {
                        return false;
                }
        }

        $(document).ready(function() {

  $(".animsition").animsition({

    inClass               :    "fade-in-up-lg",
    outClass              :    "fade-out-down-lg",
    inDuration            :     800,
    outDuration           :     500,
    linkElement           :    ".animsition-link",
    // e.g. linkElement   :
"a:not([target="_blank"]):not([href^=#])"
    loading               :     true,
    loadingParentElement  :    "body", //animsition wrapper element
    loadingClass          :    "animsition-loading",
    unSupportCss          : [ "animation-duration",
                              "-webkit-animation-duration",
                              "-o-animation-duration"
                            ],
    //"unSupportCss" option allows you to disable the "animsition"
in case the css property in the array is not supported by your
browser.
    //The default setting is to disable the "animsition" in a
browser that does not support "animation-duration".

    overlay               :    false,

    overlayClass          :    "animsition-overlay-slide",
    overlayParentElement  :    "body"
  });

    // form submit validation for images
    $("form").submit(function() {
        // construct image list
        var arr = [];
        $("#photo-list > .form-
group:not(.hidden)").each(function(i) {
                arr.push($(this).find('.photo-link').val());
        });
        $("#photos").val(JSON.stringify(arr));
        return true;
    });

    // validate YouTube links
    $("#inputYoutube").change(function (e) {
        $("#yt-alert").addClass("hidden");
        if ($(e.target).val() == "") return;
        var videoID = youtube_parse($(e.target).val());
        if (videoID === false) {
                $("#yt-alert").removeClass("hidden");
```

```
            } else {
                  $("#youtube").val(videoID);
            }
      });

      $("#inputYoutubeTC").change(function (e) {
            $("#yt-tc-alert").addClass("hidden");
            if ($(e.target).val() == "") return;
            var videoID = youtube_parse($(e.target).val());
            if (videoID === false) {
                  $("#yt-tc-alert").removeClass("hidden");
            } else {
                  $("#youtubeTC").val(videoID);
            }
      });

      // remove photo
      $(".remove-btn").click(function(e) {
            $(e.target).closest(".form-group").remove();
      });

      // add photo
      $("#add-btn").click(function() {
            if ($("#inputPhotos").val() == "") return;
            addPhoto($("#inputPhotos").val());
            $("#inputPhotos").val("");
      });

      function resizeWindow() {
            $("#floorplanOverlay").css({"height":
$("#floorplan").height() + "px", "width":  $("#floorplan").width() +
"px"});
      }

      $(window).resize(resizeWindow());

      // floor plan: location selection
      $("#floorplanOverlay").click(function(e) {
            var offset = $(this).offset();
            $("#inputLocationX").val(Math.round(e.pageX -
offset.left));
            $("#inputLocationY").val(Math.round(e.pageY -
offset.top));

            // 12 and 38 are the half of width and full height of the
pin respectively
            $("#pin").css({"display": "block", "left":
Math.round(e.pageX - offset.left) - 12, "top": Math.round(e.pageY -
offset.top) - 38});

      });

      resizeWindow();

});
</script>
```

```
</body>
</html>
```

announce.php

```php
<?php
      // check login status
      session_start();
      if (!isset($_SESSION['id'])) {
            // redirect to login.php
            $host = $_SERVER['HTTP_HOST'];
            $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
            header("Location: http://$host$uri/login.php");
      }
?>
<!DOCTYPE html>
<html>
<head>
<title>ANNOUNCEMENT</title>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-
scale=1.0, maximum-scale=1.0, user-scalable=no" />
<script src="js/jquery-2.1.1.min.js"
type="text/javascript"></script>
<script src="js/bootstrap.min.js"></script>
<script src="js/isotope.pkgd.min.js"
type="text/javascript"></script>
<script src="js/jquery.colorbox-min.js"></script>
<script src="js/jquery.animsition.min.js"></script>
<script src="js/jquery.transit.min.js"></script>
<script
src="https://cdn.firebase.com/js/client/2.0.4/firebase.js"></script>

<link rel="stylesheet" type="text/css"
href="css/bootstrap.min.css"></link>
<link rel="stylesheet" href="font-awesome-4.2.0/css/font-
awesome.min.css">
<link rel="stylesheet" type="text/css"
href="css/colorbox.css"></link>
<link rel="stylesheet" href="css/animsition.min.css">

<style>
      @font-face {
            font-family: Open Sans;
            src: url(fonts/OpenSans-Light.ttf);
      }

      * {
            font-family: Open Sans;
      }

      #closeButton {
            margin-top: 75px;
            color: #000000;
```

```css
        }

        #closeButton:hover {
            color: #000000;
        }

        #closeButton:active {
            color: #000000;
        }

        .container-fluid {
            margin-left: 5%;
            margin-right: 5%;
        }

        .buffer-2-5 {
            padding-top: 2.5%;
        }

        .buffer-5 {
            padding-top: 5%;
        }

        .operations {
            background: #CCCCCC;
        }

        .btn-group {
            margin-top: 15px;
            margin-bottom: 15px;
        }

        .main {
            color: #FFFFFF;
            background: repeating-linear-gradient(
                45deg,
                #000000,
                #000000 25px,
                #FF6600 25px,
                #FF6600 50px
            );
        }

        .disabled {
            opacity: 0.2 !important;
        }

</style>

</head>
<body>

<div class="animsition">
<div class="container-fluid vertical-center">
<div class="row">
<div class="col-md-12">
```

```
      <a href="dump_next.php" class="animsition-link"><i
id="closeButton" class="fa fa-sort-desc fa-5x"></i></a>
      <h1>ANNOUNCEMENT</h1>
      <div class="buffer"></div>
</div>
</div>
<div class="row">
      <form class="form-horizontal">
            <div class="form-group">
                  <label class="col-sm-2 control-label"
for="inputMsgTC">CHINESE MESSAGE</label>

                  <div class="col-sm-10">
                        <input class="form-control" id="inputMsgTC"
placeholder="CHINESE MESSAGE" type="text" autofocus required>
                  </div>
            </div>

            <div class="form-group">
                  <label class="col-sm-2 control-label"
for="inputMsg">ENGLISH MESSAGE</label>

                  <div class="col-sm-10">
                        <input class="form-control" id="inputMsg"
placeholder="ENGLISH MESSAGE" type="text" required>
                  </div>
            </div>

            <div class="form-group">
                  <div class="col-sm-offset-2 col-sm-10">
                        <button class="btn btn-success btn-lg"
type="submit" name="submit">
                              <i class="fa fa-floppy-o"></i>
                              MAKE AN ANNOUNCEMENT
                        </button>
                  </div>
            </div>
      </form>

</div>
<div class="buffer-5"></div>

</div>
</div>
<script>
      $(document).ready(function() {

  $(".animsition").animsition({

    inClass               :    "fade-in-up-lg",
    outClass              :    "fade-out-down-lg",
    inDuration            :     800,
    outDuration           :     500,
    linkElement           :    ".animsition-link",
    // e.g. linkElement    :
"a:not([target="_blank"]):not([href^=#])"
```

```
            loading                :      true,
            loadingParentElement   :    "body", //animsition wrapper element
            loadingClass           :    "animsition-loading",
            unSupportCss           : [ "animation-duration",
                                        "-webkit-animation-duration",
                                        "-o-animation-duration"
                                     ],
        //"unSupportCss" option allows you to disable the "animsition"
in case the css property in the array is not supported by your
browser.
        //The default setting is to disable the "animsition" in a
browser that does not support "animation-duration".

        overlay                :      false,

        overlayClass           :      "animsition-overlay-slide",
        overlayParentElement   :      "body"
    });

        // form submit: update Firebase
        $("form").submit(function() {
            if ($("#inputMsg").val() != "" &&
$("#inputMsgTC").val() != "") {

        $("[type=submit]").html("Loading...").attr("disabled",
"disabled");
                var fb = new Firebase("https://torid-heat-
3228.firebaseio.com/radar2/<?php echo $_SESSION['id']; ?>");
                fb.set({
                    message: $("#inputMsg").val(),
                    messageTC: $("#inputMsgTC").val()
                }, function() {
                    location.href = "dump.php";
                });
            }

            return false;
        });
});
</script>

</body>
</html>
```

commit.php

```
<?php
    // check login status
    session_start();
    if (!isset($_SESSION['id'])) {
        // redirect to login.php
        $host = $_SERVER['HTTP_HOST'];
        $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
        header("Location: http://$host$uri/login.php");
    }
```

```php
      // check existence of parameter
      if (isset($_REQUEST['target'])) {
            $con = new mysqli("","","","");
            if (mysqli_connect_errno()) {
                  echo "Failed to connect to MySQL: " .
mysqli_connect_error();
            }
            $con->query("SET NAMES utf8");

            // target == "current": commit
            // 1. validate next exhibition
            // 2. overwrite backup with current exhibition
            // 3. overwrite current exhibition with next exhibition
            if ($_REQUEST['target'] == "current") {
                  // validate next exhibition

                  // overwrite exhibitions
                  $stmt = $con->prepare("DELETE FROM
lyu1403_cms_item_prev WHERE user = ?");
                  $stmt->bind_param("s", $_SESSION['id']);
                  $stmt->execute();

                  $stmt = $con->prepare("INSERT INTO
lyu1403_cms_item_prev (SELECT * FROM lyu1403_cms_item WHERE user
= ?)");
                  $stmt->bind_param("s", $_SESSION['id']);
                  $stmt->execute();

                  $stmt = $con->prepare("DELETE FROM lyu1403_cms_item
WHERE user = ?");
                  $stmt->bind_param("s", $_SESSION['id']);
                  $stmt->execute();

                  $stmt = $con->prepare("INSERT INTO lyu1403_cms_item
 (SELECT * FROM lyu1403_cms_item_next WHERE user = ?)");
                  $stmt->bind_param("s", $_SESSION['id']);
                  $stmt->execute();

                  // overwrite exhibition settings
                  $stmt = $con->prepare("SELECT title, titleTC,
description, descriptionTC, image, floorplan FROM
lyu1403_cms_exhibition WHERE user = ?");
                  $stmt->bind_param("s", $_SESSION['id']);
                  $stmt->execute();
                  $stmt->bind_result($title, $titleTC, $description,
$descriptionTC, $image, $floorplan);
                  $stmt->store_result();
                  $stmt->fetch();

                  $stmt = $con->prepare("UPDATE lyu1403_cms_exhibition
SET title_prev = ?, titleTC_prev = ?, description_prev = ?,
descriptionTC_prev = ?, image_prev = ?, floorplan_prev = ? WHERE
user = ?");
                  $stmt->bind_param("sssssss", $title, $titleTC,
$description, $descriptionTC, $image, $floorplan, $_SESSION['id']);
```

```php
                $stmt->execute();

                $stmt = $con->prepare("SELECT title_next,
titleTC_next, description_next, descriptionTC_next, image_next,
floorplan_next FROM lyu1403_cms_exhibition WHERE user = ?");
                $stmt->bind_param("s", $_SESSION['id']);
                $stmt->execute();
                $stmt->bind_result($title, $titleTC, $description,
$descriptionTC, $image, $floorplan);
                $stmt->store_result();
                $stmt->fetch();

                $stmt = $con->prepare("UPDATE lyu1403_cms_exhibition
SET title = ?, titleTC = ?, description = ?, descriptionTC = ?,
image = ?, floorplan = ? WHERE user = ?");
                $stmt->bind_param("sssssss", $title, $titleTC,
$description, $descriptionTC, $image, $floorplan, $_SESSION['id']);
                $stmt->execute();
            }

        // target == "backup": restore from backup
        // swap backup and current exhibition
        elseif ($_REQUEST['target'] == "backup") {
                // swap items
                $stmt = $con->prepare("INSERT INTO
lyu1403_cms_item_tmp (SELECT * FROM lyu1403_cms_item WHERE user
= ?)");
                $stmt->bind_param("s", $_SESSION['id']);
                $stmt->execute();

                $stmt = $con->prepare("DELETE FROM lyu1403_cms_item
WHERE user = ?");
                $stmt->bind_param("s", $_SESSION['id']);
                $stmt->execute();

                $stmt = $con->prepare("INSERT INTO lyu1403_cms_item
(SELECT * FROM lyu1403_cms_item_prev WHERE user = ?)");
                $stmt->bind_param("s", $_SESSION['id']);
                $stmt->execute();

                $stmt = $con->prepare("DELETE FROM
lyu1403_cms_item_prev WHERE user = ?");
                $stmt->bind_param("s", $_SESSION['id']);
                $stmt->execute();

                $stmt = $con->prepare("INSERT INTO
lyu1403_cms_item_prev (SELECT * FROM lyu1403_cms_item_tmp WHERE user
= ?)");
                $stmt->bind_param("s", $_SESSION['id']);
                $stmt->execute();

                $stmt = $con->prepare("DELETE FROM
lyu1403_cms_item_tmp WHERE user = ?");
                $stmt->bind_param("s", $_SESSION['id']);
                $stmt->execute();
```

```php
                // swap exhibition settings
                $stmt = $con->prepare("SELECT title, titleTC,
description, descriptionTC, image, floorplan FROM
lyu1403_cms_exhibition WHERE user = ?");
                $stmt->bind_param("s", $_SESSION['id']);
                $stmt->execute();
                $stmt->bind_result($title, $titleTC, $description,
$descriptionTC, $image, $floorplan);
                $stmt->store_result();
                $stmt->fetch();

                $stmt = $con->prepare("SELECT title_prev,
titleTC_prev, description_prev, descriptionTC_prev, image_prev,
floorplan_prev FROM lyu1403_cms_exhibition WHERE user = ?");
                $stmt->bind_param("s", $_SESSION['id']);
                $stmt->execute();
                $stmt->bind_result($title2, $titleTC2,
$description2, $descriptionTC2, $image2, $floorplan2);
                $stmt->store_result();
                $stmt->fetch();

                $stmt = $con->prepare("UPDATE lyu1403_cms_exhibition
SET title_prev = ?, titleTC_prev = ?, description_prev = ?,
descriptionTC_prev = ?, image_prev = ?, floorplan_prev = ? WHERE
user = ?");
                $stmt->bind_param("sssssss", $title, $titleTC,
$description, $descriptionTC, $image, $floorplan, $_SESSION['id']);
                $stmt->execute();

                $stmt = $con->prepare("UPDATE lyu1403_cms_exhibition
SET title = ?, titleTC = ?, description = ?, descriptionTC = ?,
image = ?, floorplan = ? WHERE user = ?");
                $stmt->bind_param("sssssss", $title2, $titleTC2,
$description2, $descriptionTC2, $image2, $floorplan2,
$_SESSION['id']);
                $stmt->execute();
            }

            // target == "next": restore from next exhibition
            // 1. validate next exhibition
            // 2. swap next and current exhibition
            elseif ($_REQUEST['target'] == "next") {
                // validate next exhibition

                // swap next and current exhibition
                $stmt = $con->prepare("INSERT INTO
lyu1403_cms_item_tmp (SELECT * FROM lyu1403_cms_item WHERE user
= ?)");
                $stmt->bind_param("s", $_SESSION['id']);
                $stmt->execute();

                $stmt = $con->prepare("DELETE FROM lyu1403_cms_item
WHERE user = ?");
                $stmt->bind_param("s", $_SESSION['id']);
                $stmt->execute();
```

```php
                $stmt = $con->prepare("INSERT INTO lyu1403_cms_item
(SELECT * FROM lyu1403_cms_item_next WHERE user = ?)");
                $stmt->bind_param("s", $_SESSION['id']);
                $stmt->execute();

                $stmt = $con->prepare("DELETE FROM
lyu1403_cms_item_next WHERE user = ?");
                $stmt->bind_param("s", $_SESSION['id']);
                $stmt->execute();

                $stmt = $con->prepare("INSERT INTO
lyu1403_cms_item_next (SELECT * FROM lyu1403_cms_item_tmp WHERE user
= ?)");
                $stmt->bind_param("s", $_SESSION['id']);
                $stmt->execute();

                $stmt = $con->prepare("DELETE FROM
lyu1403_cms_item_tmp WHERE user = ?");
                $stmt->bind_param("s", $_SESSION['id']);
                $stmt->execute();

                // swap exhibition settings
                $stmt = $con->prepare("SELECT title, titleTC,
description, descriptionTC, image, floorplan FROM
lyu1403_cms_exhibition WHERE user = ?");
                $stmt->bind_param("s", $_SESSION['id']);
                $stmt->execute();
                $stmt->bind_result($title, $titleTC, $description,
$descriptionTC, $image, $floorplan);
                $stmt->store_result();
                $stmt->fetch();

                $stmt = $con->prepare("SELECT title_next,
titleTC_next, description_next, descriptionTC_next, image_next,
floorplan_next FROM lyu1403_cms_exhibition WHERE user = ?");
                $stmt->bind_param("s", $_SESSION['id']);
                $stmt->execute();
                $stmt->bind_result($title2, $titleTC2,
$description2, $descriptionTC2, $image2, $floorplan2);
                $stmt->store_result();
                $stmt->fetch();

                $stmt = $con->prepare("UPDATE lyu1403_cms_exhibition
SET title_next = ?, titleTC_next = ?, description_next = ?,
descriptionTC_next = ?, image_next = ?, floorplan_next = ? WHERE
user = ?");
                $stmt->bind_param("sssssss", $title, $titleTC,
$description, $descriptionTC, $image, $floorplan, $_SESSION['id']);
                $stmt->execute();

                $stmt = $con->prepare("UPDATE lyu1403_cms_exhibition
SET title = ?, titleTC = ?, description = ?, descriptionTC = ?,
image = ?, floorplan = ? WHERE user = ?");
                $stmt->bind_param("sssssss", $title2, $titleTC2,
$description2, $descriptionTC2, $image2, $floorplan2,
$_SESSION['id']);
```

```php
            $stmt->execute();
        }

        // target == "rollback": restore next exhibition to
current exhibition
        // overwrite next exhibition with current exhibition
        elseif ($_REQUEST['target'] == "rollback") {
            $stmt = $con->prepare("DELETE FROM
lyu1403_cms_item_next WHERE user = ?");
            $stmt->bind_param("s", $_SESSION['id']);
            $stmt->execute();

            $stmt = $con->prepare("INSERT INTO
lyu1403_cms_item_next (SELECT * FROM lyu1403_cms_item WHERE user
= ?)");
            $stmt->bind_param("s", $_SESSION['id']);
            $stmt->execute();

            $stmt = $con->prepare("SELECT title, titleTC,
description, descriptionTC, image, floorplan FROM
lyu1403_cms_exhibition WHERE user = ?");
            $stmt->bind_param("s", $_SESSION['id']);
            $stmt->execute();
            $stmt->bind_result($title, $titleTC, $description,
$descriptionTC, $image, $floorplan);
            $stmt->store_result();
            $stmt->fetch();

            $stmt = $con->prepare("UPDATE lyu1403_cms_exhibition
SET title_next = ?, titleTC_next = ?, description_next = ?,
descriptionTC_next = ?, image_next = ?, floorplan_next = ? WHERE
user = ?");
            $stmt->bind_param("sssssss", $title, $titleTC,
$description, $descriptionTC, $image, $floorplan, $_SESSION['id']);
            $stmt->execute();
        }

        // regenerate beacon->exhibition translation table
        $stmt = $con->prepare("DELETE FROM lyu1403_cms_beacon
WHERE exhibition = ?");
        $stmt->bind_param("s", $_SESSION['id']);
        $stmt->execute();

        $stmt = $con->prepare("INSERT IGNORE INTO
lyu1403_cms_beacon (SELECT DISTINCT uuid, major, minor, user FROM
lyu1403_cms_item WHERE user = ? AND uuid <> \"\")");
        $stmt->bind_param("s", $_SESSION['id']);
        $stmt->execute();

        // regenerate criteria JSON file
        $exhibition = array();
        $exhibition['id'] = $_SESSION['id'];
        $stmt = $con->prepare("SELECT title, titleTC FROM
lyu1403_cms_exhibition WHERE user = ?");
        $stmt->bind_param("s", $_SESSION['id']);
        $stmt->execute();
```

```php
        $stmt->bind_result($exhibition['title'],
$exhibition['titleTC']);
        $stmt->store_result();
        $stmt->fetch();

        $items = array();
        $stmt = $con->prepare("SELECT id, uuid, major, minor,
angle1, angle2, locationX, locationY, title, titleTC FROM
lyu1403_cms_item WHERE user = ? AND uuid <> \"\"");
        $stmt->bind_param("s", $_SESSION['id']);
        $stmt->execute();
        $stmt->store_result();
        for ($i = 0; $i < $stmt->num_rows; $i++) {
                $item = array();
                $stmt->bind_result($item['id'], $item['uuid'],
$item['major'], $item['minor'], $item['angle1'], $item['angle2'],
$item['locationX'], $item['locationY'], $item['title'],
$item['titleTC']);
                $stmt->fetch();
                array_push($items, $item);
        }

        $exhibition['items'] = $items;
        $json = fopen("json/" . $_SESSION['id'] . ".json", 'w');
        fwrite($json, json_encode($exhibition));
        fclose($json);
    }

    if ($_REQUEST['target'] == "rollback") {
        // redirect to dump_next.php
        $host = $_SERVER['HTTP_HOST'];
        $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
        header("Location: http://$host$uri/dump_next.php");
        exit(0);
    }

    // redirect to dump.php
    $host = $_SERVER['HTTP_HOST'];
    $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
    header("Location: http://$host$uri/dump.php");
?>
```

delete.php

```php
<?php
    // check login status
    session_start();
    if (!isset($_SESSION['id'])) {
        // redirect to login.php
        $host = $_SERVER['HTTP_HOST'];
        $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
        header("Location: http://$host$uri/login.php");
    }

    // check existence of parameter
```

```php
        if (isset($_REQUEST['id']) || isset($_REQUEST['all'])) {
                $con = new mysqli("","","","");
                if (mysqli_connect_errno()) {
                        echo "Failed to connect to MySQL: " .
mysqli_connect_error();
                }
                $con->query("SET NAMES utf8");

                // delete specified item
                if (isset($_REQUEST['id'])) {
                        $stmt = $con->prepare("DELETE FROM
lyu1403_cms_item_next WHERE id = ? AND user = ?");
                        $stmt->bind_param("is", $_REQUEST["id"],
$_SESSION["id"]);
                        $stmt->execute();
                }

                // delete all items belonging to user
                else if (isset($_REQUEST['all'])) {
                        $stmt = $con->prepare("DELETE FROM
lyu1403_cms_item_next WHERE user = ?");
                        $stmt->bind_param("s", $_SESSION["id"]);
                        $stmt->execute();
                }
        }

        // redirect to dump_next.php
        $host = $_SERVER['HTTP_HOST'];
        $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
        header("Location: http://$host$uri/dump_next.php");
?>
```

dump.php

```php
<?php
        // check login status
        session_start();
        if (!isset($_SESSION['id'])) {
                // redirect to login.php
                $host = $_SERVER['HTTP_HOST'];
                $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
                header("Location: http://$host$uri/login.php");
        }

        $con = new mysqli("","","","");
        if (mysqli_connect_errno()) {
                echo "Failed to connect to MySQL: " .
mysqli_connect_error();
        }
        mysqli_query($con, "SET NAMES utf8");

        // retrieve category list
        $stmt = $con->prepare("SELECT id, description FROM
lyu1403_cms_location WHERE user = ?");
        $stmt->bind_param("s", $_SESSION['id']);
```

```php
        $stmt->execute();
        $stmt->store_result();
        $stmt->bind_result($cat_id, $cat_name);

        // retrieve beacons
        $stmt2 = $con->prepare("SELECT id, title, category, photos FROM
lyu1403_cms_item WHERE user = ?");
        $stmt2->bind_param("s", $_SESSION['id']);
        $stmt2->execute();
        $stmt2->store_result();
        $stmt2->bind_result($item_id, $item_name, $item_cat,
$item_photos);

        // retreive analytics
        $rs = $con->query("SELECT item, COUNT(installationID) AS visit,
AVG(rating) AS rating, COUNT(comment) AS comment FROM
lyu1403_cms_log GROUP BY item");
        $analytics = array();
        while ($row = $rs->fetch_assoc()) {
                $analytics[$row['item']] = $row;
        }
?>
<!DOCTYPE html>
<html>
<head>
<title>DASHBOARD</title>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-
scale=1.0, maximum-scale=1.0, user-scalable=no" />
<script src="js/jquery-2.1.1.min.js"
type="text/javascript"></script>
<script src="js/bootstrap.min.js"></script>
<script src="js/isotope.pkgd.min.js"
type="text/javascript"></script>
<script src="js/jquery.colorbox-min.js"></script>
<script src="js/jquery.animsition.min.js"></script>
<script src="js/jquery.transit.min.js"></script>

<link rel="stylesheet" type="text/css" href="css/bootstrap.min.css">
<link rel="stylesheet" href="font-awesome-4.2.0/css/font-
awesome.min.css">
<link rel="stylesheet" type="text/css" href="css/colorbox.css">
<link rel="stylesheet" href="css/animsition.min.css">

<style>
        @font-face {
                font-family: Open Sans;
                src: url(fonts/OpenSans-Light.ttf);
        }

        * {
                font-family: Open Sans;
        }

        #titlepic {
                margin-top: 75px;
```

```css
}

.container-fluid {
    margin-left: 5%;
    margin-right: 5%;
}

.item {
    width: 175px;
    height: 175px;
    margin: 5px;
    background: #FF6600;
    color: #000000;
    padding: 10px;
}

a.item:link, a.item:visited, a.item:active {
    text-decoration: none;
    color: #FFFFFF;
    text-shadow: 0px 0px 10px #000000;
}

a.item:hover {
    transition: all ease 0.25s;
    border: solid #000000 5px;
}

.buffer-2-5 {
    margin-top: 2.5%;
}

.buffer-5 {
    margin-top: 5%;
}

.operations {
    background: #CCCCCC;
}

.btn-group {
    margin-top: 15px;
    margin-bottom: 15px;
}

.main {
    color: #FFFFFF;
    background: repeating-linear-gradient(
        45deg,
        #000000,
        #000000 25px,
        #FF6600 25px,
        #FF6600 50px
    );
}

.beaconID {
```

```css
        position: absolute;
        top: 5px;
        right: 5px;
        font-size: 15px;
}

.description {
        position: absolute;
        top: 20px;
        left: 10px;
        margin-right: 10px;
        font-size: 17.5px;
}

#navBar {
        background: #000000;
        color: #FFFFFF;
        text-align: center;
        font-size: 15px;
        vertical-align: middle;
        position: fixed;
        top: 0;
        margin: 0;
        padding-top: 5px;
        padding-bottom: 5px;
        width: 100%;
        z-index: 9999;
        -webkit-transition: ease 0.25s;
        -moz-transition: ease 0.25s;
        -o-transition: ease 0.25s;
        transition: ease 0.25s;
}

.navBarHover {
        padding-top: 15px !important;
        padding-bottom: 15px !important;
        background: #FF6600 !important;
}

.visibleNavElement {
        color: #FFFFFF !important;
}

#navCurrent {
        text-decoration: none;
        transition: ease 0.25s;
}

.navHover {
        text-decoration: underline !important;
}

#navBackup, #navNext {
        color: #000000;
        transition: ease 0.25s;
}
```

```
      .disabled {
            opacity: 0.2 !important;
      }

</style>

</head>
<body>

<div class="container-fluid vertical-center">
<div class="row">
<div class="col-md-12">
      <img id="titlepic" class="img-responsive" src="img/radar.png">
      <h1>DASHBOARD</h1>
      <div class="buffer"></div>
</div>
</div>
<div class="row">

<div class="col-sm-3">
<h2>OPERATIONS</h2>
      <div class="animsition">
            <div class="btn-group">
                  <input type="text" class="form-control"
id="searchBox" placeholder="SEARCH" autofocus>
            </div>
            <div class="buffer-2-5"></div>
            <a class="btn btn-success btn-lg" href="dump_next.php"
data-toggle="tooltip" data-placement="right" title="Modify NEXT
EXHIBITION">
                  <i class="fa fa-plus-circle"></i>
                  ADD / EDIT
            </a>
            <div class="buffer-2-5"></div>
            <div class="dropdown">
                  <button class="btn btn-warning btn-lg dropdown-
toggle" type="button" id="restoreData" data-toggle="dropdown">
                        <i class="fa fa-fire-extinguisher"></i>
                        RESTORE
                        <span class="caret"></span>
                  </button>
                  <ul class="dropdown-menu" role="menu" aria-
labelledby="restoreData">
                        <li role="presentation" class="dropdown-
header">FROM BACKUP</li>
                        <li role="presentation"><a role="menuitem"
tabindex="-1" href="commit.php?target=backup">CONFIRM</a></li>
                        <li role="presentation" class="divider"></li>
                        <li role="presentation" class="dropdown-
header">FROM NEXT EXHIBITION</li>
                        <li role="presentation"><a role="menuitem"
tabindex="-1" href="commit.php?target=next">CONFIRM</a></li>
                  </ul>
            </div>
            <hr>
```

```
            <a class="btn btn-info btn-lg" href="overview.php">
                  <i class="fa fa-university"></i>
                  OVERVIEW
            </a>
            <div class="buffer-2-5"></div>
            <a class="btn btn-info btn-lg" href="announce.php">
                  <i class="fa fa-bullhorn"></i>
                  ANNOUNCEMENT
            </a>
            <hr>
            <!--button class="btn btn-info btn-lg disabled"
id="events">
                  <i class="fa fa-clock-o"></i>
                  EVENTS
            </button-->
            <div class="buffer-2-5"></div>
            <a href="login.php?logout">
            <button class="btn btn-primary btn-lg "
id="logoutButton">
                  <i class="fa fa-lock"></i>
                  LOG OUT
            </button>
            </a>
            <div class="buffer-2-5"></div>
      </div>
</div>
<div class="col-sm-9">
<h2>ITEMS</h2>
<div class="animsition">
<div class="beaconFilter">

      <div class="btn-group">
            <a class="btn btn-default current" href="#" data-
filter="*" id="allBeacons">ALL</a>

            <?php for ($i = 0; $i < $stmt->num_rows; $i++) {
                  $stmt->fetch(); ?>
            <a class="btn btn-default" href="#" data-filter=".<?php
echo $cat_id; ?>"><?php echo strtoupper($cat_name); ?></a>
            <?php } ?>
      </div>

      <!--div class="btn-group">
            <a class="btn btn-default" href="#" data-
filter=".main">UNDER MAINTENANCE</a>
      </div-->

      <br>

      <div class="beaconOrder btn-group">
            <button class="btn btn-default current" data-
filter="beaconID">ID</button>
            <button class="btn btn-default" data-
filter="description">TITLE</button>
            <button class="btn btn-default" data-
filter="visit">VISITOR COUNT</button>
```

```
                <button class="btn btn-default" data-
filter="rating">AVERAGE RATING</button>
                <button class="btn btn-default" data-
filter="comment">COMMENT COUNT</button>
        </div>
</div>

<div class="beaconContainer">

        <?php for ($i = 0; $i < $stmt2->num_rows; $i++) {
                $stmt2->fetch();
                $photos = json_decode($item_photos); ?>
        <a class="item <?php echo $item_cat; ?>"<?php if
(count($photos) > 0) { ?> style="background: url(<?php echo
$photos[0]; ?>) no-repeat center center scroll;"<?php } ?>
href="preview.php?id=<?php echo $item_id; ?>">
                <p class="beaconID hidden"><?php echo $item_id; ?></p>
                <p class="description"><?php echo
strtoupper($item_name); ?></p>
                <p class="visit hidden"><?php echo
isset($analytics[$item_id]) && $analytics[$item_id]['visit'] !=
null ? $analytics[$item_id]['visit'] : "0"; ?></p>
                <p class="rating hidden"><?php echo
isset($analytics[$item_id]) && $analytics[$item_id]['rating'] !=
null ? $analytics[$item_id]['rating'] : "0"; ?></p>
                <p class="comment hidden"><?php echo
isset($analytics[$item_id]) && $analytics[$item_id]['comment'] !=
null ? $analytics[$item_id]['comment'] : "0"; ?></p>
        </a>
        <?php } ?>

</div>
</div>
</div>
</div>
</div>
<div class="buffer-5"></div>


<div class="container-fluid" id="navBar">
        <div class="row">
                <a href="dump_prev.php" class="animsition-link">
                        <div class="col-sm-4 invisibleNavElement"
id="navBackup">
                                <span>BACKUP</span>
                                <i class="fa fa-arrow-circle-left">
                                </i>
                        </div>
                </a>
                <div class="col-sm-4" id="navCurrent">
                        <span>CURRENT EXHIBITION</span>
                </div>
                <a href="dump_next.php" class="animsition-link">
                        <div class="col-sm-4 invisibleNavElement"
id="navNext">
                                <i class="fa fa-arrow-circle-right">
```

```
                    </i>
                    <span>NEXT EXHIBITION</span>
                </div>
            </a>
        </div>
</div>

<script type="text/javascript">

$(window).load(function(){
    var $container = $(".beaconContainer");
    $container.isotope({
        filter: "*",
        sortBy: "beaconID",
        animationOptions: {
            duration: 750,
            easing: "linear",
            queue: false
        },
          getSortData: {
                beaconID: '.beaconID parseInt',
                description: '.description',
                visit: '.visit parseInt',
                rating: '.rating parseFloat',
                comment: '.comment praseInt'
            }
    });

    $(".beaconFilter a").click(function(){
        $(".beaconFilter .current").removeClass("current");
        $(this).addClass("current");

        var selector = $(this).attr("data-filter");
        $container.isotope({
            filter: selector,
            sortBy: "description",
            animationOptions: {
                duration: 750,
                easing: "linear",
                queue: false
            }
         });
         return false;
    });

      $(".beaconOrder button").click(function(){
         $(".beaconOrder .current").removeClass("current");
         $(this).addClass("current");

         var selector = $(this).attr("data-filter");
            var sortAsc = true;
            if (selector == 'visit' || selector == 'rating' ||
selector == 'comment') {
                  sortAsc = false;
            }
         $(".beaconContainer").isotope({
```
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```javascript
                sortBy: selector,
                    sortAscending: sortAsc
            });
            return false;
    });
});

      $("#allBeacons").addClass("active");
      $(".btn-default").click(function () {
            $(".btn-default").removeClass("active");
            $(this).addClass("active");
      });

      $("#searchBox").on("input", function () {
            var regex = new RegExp($(this).val(), "i");
            if ($(this).val()=="") {
                   $(".btn-default").removeClass("disabled");
                   $("#allBeacons").addClass("active");
            }
            else {
                   $(".btn-default").removeClass("active");
                   $(".btn-default").addClass("disabled");
            }
            $(".beaconContainer").isotope({ filter: function() {
                   var name = $(this).find(".description").text();
                   return name.match(regex);
            } })
      });

      $("#navBar").hover(function () {
            $("#navBackup").toggleClass("visibleNavElement");
            $("#navNext").toggleClass("visibleNavElement");
            $("#navCurrent").toggleClass("navHover");
            $(this).toggleClass("navBarHover");
      });

      $(document).ready(function() {

  $(".animsition").animsition({

    inClass                :    "zoom-in-sm",
    outClass               :    "zoom-out",
    inDuration             :     800,
    outDuration            :     500,
    linkElement            :    ".animsition-link",
    // e.g. linkElement     :
"a:not([target="_blank"]):not([href^=#])"
    loading                :     true,
    loadingParentElement   :    "body", //animsition wrapper element
    loadingClass           :    "animsition-loading",
    unSupportCss           : [ "animation-duration",
                               "-webkit-animation-duration",
                               "-o-animation-duration"
                             ],
    //"unSupportCss" option allows you to disable the "animsition"
in case the css property in the array is not supported by your
```

```
browser.
    //The default setting is to disable the "animsition" in a
browser that does not support "animation-duration".

    overlay              :     false,

    overlayClass         :     "animsition-overlay-slide",
    overlayParentElement :     "body"
  });

    // enable tooltip
    $(function () {
        $('[data-toggle="tooltip"]').tooltip()
    })
});

    $("#logoutButton").click(function () {
        $("body").transition({scale: 0.8, opacity: 0});
    });
</script>

</body>
</html>
```

dump_next.php

```php
<?php
    // check login status
    session_start();
    if (!isset($_SESSION['id'])) {
        // redirect to login.php
        $host = $_SERVER['HTTP_HOST'];
        $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
        header("Location: http://$host$uri/login.php");
    }

    $con = new mysqli("","","","");
    if (mysqli_connect_errno()) {
        echo "Failed to connect to MySQL: " .
mysqli_connect_error();
    }
    mysqli_query($con, "SET NAMES utf8");

    // retrieve category list
    $stmt = $con->prepare("SELECT id, description FROM
lyu1403_cms_location WHERE user = ?");
    $stmt->bind_param("s", $_SESSION['id']);
    $stmt->execute();
    $stmt->store_result();
    $stmt->bind_result($cat_id, $cat_name);

    // retrieve beacons
    $stmt2 = $con->prepare("SELECT id, title, category, photos FROM
lyu1403_cms_item_next WHERE user = ?");
    $stmt2->bind_param("s", $_SESSION['id']);
```

```php
      $stmt2->execute();
      $stmt2->store_result();
      $stmt2->bind_result($item_id, $item_name, $item_cat,
$item_photos);
?>
```
```html
<!DOCTYPE html>
<html>
<head>
<title>DASHBOARD</title>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-
scale=1.0, maximum-scale=1.0, user-scalable=no" />
<script src="js/jquery-2.1.1.min.js"
type="text/javascript"></script>
<script src="js/bootstrap.min.js"></script>
<script src="js/isotope.pkgd.min.js"
type="text/javascript"></script>
<script src="js/jquery.colorbox-min.js"></script>
<script src="js/jquery.animsition.min.js"></script>
<script src="js/jquery.transit.min.js"></script>

<link rel="stylesheet" type="text/css" href="css/bootstrap.min.css">
<link rel="stylesheet" href="font-awesome-4.2.0/css/font-
awesome.min.css">
<link rel="stylesheet" type="text/css" href="css/colorbox.css">
<link rel="stylesheet" href="css/animsition.min.css">

<style>
      @font-face {
            font-family: Open Sans;
            src: url(fonts/OpenSans-Light.ttf);
      }

      * {
            font-family: Open Sans;
      }

      #titlepic {
            margin-top: 75px;
      }

      .container-fluid {
            margin-left: 5%;
            margin-right: 5%;
      }

      .item {
            width: 175px;
            height: 175px;
            margin: 5px;
            background: #FF6600;
            color: #000000;
            padding: 10px;
      }

      a.item:link, a.item:visited, a.item:active {
```

```css
        text-decoration: none;
        color: #FFFFFF;
        text-shadow: 0px 0px 10px #000000;
}

a.item:hover {
        transition: all ease 0.25s;
        border: solid #000000 5px;
}

.buffer-2-5 {
        margin-top: 2.5%;
}

.buffer-5 {
        margin-top: 5%;
}

.operations {
        background: #CCCCCC;
}

.btn-group {
        margin-top: 15px;
        margin-bottom: 15px;
}

.main {
        color: #FFFFFF;
        background: repeating-linear-gradient(
                45deg,
                #000000,
                #000000 25px,
                #FF6600 25px,
                #FF6600 50px
        );
}

.beaconID {
        position: absolute;
        top: 5px;
        right: 5px;
        font-size: 15px;
}

.description {
        position: absolute;
        top: 20px;
        left: 10px;
        margin-right: 10px;
        font-size: 17.5px;
}

#navBar {
        background: #000000;
        color: #FFFFFF;
```

```
                text-align: center;
                font-size: 15px;
                vertical-align: middle;
                position: fixed;
                top: 0;
                margin: 0;
                padding-top: 5px;
                padding-bottom: 5px;
                width: 100%;
                z-index: 9999;
                -webkit-transition: ease 0.25s;
                -moz-transition: ease 0.25s;
                -o-transition: ease 0.25s;
                transition: ease 0.25s;
        }

        .navBarHover {
                padding-top: 15px !important;
                padding-bottom: 15px !important;
                background: #FF6600 !important;
        }

        .visibleNavElement {
                color: #FFFFFF !important;
        }

        #navNext {
                text-decoration: none;
                transition: ease 0.25s;
        }

        .navHover {
                text-decoration: underline !important;
        }

        #navBackup, #navCurrent {
                color: #000000;
                transition: ease 0.25s;
        }

        .disabled {
                opacity: 0.2 !important;
        }

</style>

</head>
<body>

<div class="container-fluid vertical-center">
<div class="row">
<div class="col-md-12">
        <img id="titlepic" class="img-responsive" src="img/radar.png">
        <h1>DASHBOARD</h1>
        <div class="buffer"></div>
</div>
```

```
</div>
<div class="row">

<div class="col-sm-3">
<h2>OPERATIONS</h2>
     <div class="animsition">
          <div class="btn-group">
               <input type="text" class="form-control"
id="searchBox" placeholder="SEARCH" autofocus>
          </div>
          <div class="buffer-2-5"></div>
          <a class="btn btn-success btn-lg" href="add.php">
               <i class="fa fa-plus-circle"></i>
               ADD
          </a>
          <div class="buffer-2-5"></div>
          <div class="dropdown">
               <button class="btn btn-success btn-lg" type="button"
id="commit" data-toggle="dropdown">
                    <i class="fa fa-upload"></i>
                    COMMIT
                    <span class="caret"></span>
               </button>
               <ul class="dropdown-menu" role="menu" aria-
labelledby="commit">
                    <li role="presentation" class="dropdown-
header">COMMIT</li>
                    <li role="presentation"><a role="menuitem"
tabindex="-1" href="commit.php?target=current">CONFIRM</a></li>
               </ul>
          </div>
          <div class="buffer-2-5"></div>
          <div class="dropdown">
               <button class="btn btn-warning btn-lg dropdown-
toggle" type="button" id="restoreData" data-toggle="dropdown">
                    <i class="fa fa-fire-extinguisher"></i>
                    RESTORE
                    <span class="caret"></span>
               </button>
               <ul class="dropdown-menu" role="menu" aria-
labelledby="restoreData">
                    <li role="presentation" class="dropdown-
header">FROM CURRENT EXHIBITION</li>
                    <li role="presentation"><a role="menuitem"
tabindex="-1" href="commit.php?target=rollback">CONFIRM</a></li>
               </ul>
          </div>
          <div class="buffer-2-5"></div>
          <div class="dropdown">
               <button class="btn btn-danger btn-lg dropdown-
toggle" type="button" id="deleteBeacons" data-toggle="dropdown">
                    <i class="fa fa-times-circle"></i>
                    DELETE ALL
                    <span class="caret"></span>
               </button>
               <ul class="dropdown-menu" role="menu" aria-
```

```html
labelledby="deleteBeacons">
                        <li role="presentation" class="dropdown-
header">DELETE ALL BEACONS</li>
                        <li role="presentation"><a role="menuitem"
tabindex="-1" href="delete.php?all">CONFIRM</a></li>
                </ul>
            </div>
            <hr>
            <a class="btn btn-info btn-lg" href="exhibition.php">
                    <i class="fa fa-cog"></i>
                    SETTINGS
            </a>
            <div class="buffer-2-5"></div>
            <a class="btn btn-info btn-lg"
href="overview.php?type=next">
                    <i class="fa fa-university"></i>
                    OVERVIEW
            </a>
            <hr>
            <a href="login.php?logout">
                    <button class="btn btn-primary btn-lg "
id="logoutButton">
                        <i class="fa fa-lock"></i>
                        LOG OUT
                    </button>
            </a>
            <div class="buffer-2-5"></div>
    </div>
</div>
<div class="col-sm-9">
<h2>ITEMS</h2>
<div class="animsition">
<div class="beaconFilter">

    <div class="btn-group">
            <a class="btn btn-default" href="#" data-filter="*"
class="current" id="allBeacons">ALL</a>
            <?php for ($i = 0; $i < $stmt->num_rows; $i++) {
                $stmt->fetch(); ?>
            <a class="btn btn-default" href="#" data-filter=".<?php
echo $cat_id; ?>"><?php echo strtoupper($cat_name); ?></a>
            <?php } ?>
    </div>

    <!--div class="btn-group">
            <a class="btn btn-default" href="#" data-
filter=".main">UNDER MAINTENANCE</a>
    </div-->

    <br>

    <div class="beaconOrder btn-group">
            <button class="btn btn-default current" data-
filter="beaconID">ID</button>
            <button class="btn btn-default" data-
filter="description">TITLE</button>
```

```php
        </div>
</div>

<div class="beaconContainer">

      <?php for ($i = 0; $i < $stmt2->num_rows; $i++) {
            $stmt2->fetch();
            $photos = json_decode($item_photos); ?>
      <a class="item <?php echo $item_cat; ?>"<?php if
(count($photos) > 0) { ?> style="background: url(<?php echo
$photos[0]; ?>) no-repeat center center scroll;"<?php } ?>
href="preview.php?type=next&id=<?php echo $item_id; ?>">
            <p class="beaconID hidden"><?php echo $item_id; ?></p>
            <p class="description"><?php echo
strtoupper($item_name); ?></p>
      </a>
      <?php } ?>

</div>
</div>
</div>
</div>
</div>
<div class="buffer-5"></div>


<div class="container-fluid" id="navBar">
      <div class="row">
            <a href="dump_prev.php" class="animsition-link">
                  <div class="col-sm-4 invisibleNavElement"
id="navBackup">
                        <span>BACKUP</span>
                        <i class="fa fa-arrow-circle-left">
                        </i>
                  </div>
            </a>
            <a href="dump.php" class="animsition-link">
                  <div class="col-sm-4 invisibleNavElement"
id="navCurrent">
                        <span>CURRENT EXHIBITION</span>
                        <i class="fa fa-arrow-circle-left">
                        </i>
                  </div>
            </a>
            <div class="col-sm-4" id="navNext">
                  <span>NEXT EXHIBITION</span>
            </div>
      </div>
</div>

<script type="text/javascript">

$(window).load(function(){
    var $container = $(".beaconContainer");
    $container.isotope({
        filter: "*",
```

```
        sortBy: "beaconID",
        animationOptions: {
            duration: 750,
            easing: "linear",
            queue: false
        },
          getSortData: {
                beaconID: '.beaconID parseInt',
                description: '.description',
          }
    });

    $(".beaconFilter a").click(function(){
        $(".beaconFilter .current").removeClass("current");
        $(this).addClass("current");

        var selector = $(this).attr("data-filter");
        $container.isotope({
            filter: selector,
            sortBy: "beaconID",
            animationOptions: {
                duration: 750,
                easing: "linear",
                queue: false
            }
         });
         return false;
    });

     $(".beaconOrder button").click(function(){
        $(".beaconOrder .current").removeClass("current");
        $(this).addClass("current");

        var selector = $(this).attr("data-filter");
        $(".beaconContainer").isotope({
            sortBy: selector,
         });
         return false;
    });
});

    $("#allBeacons").addClass("active");
    $(".btn-default").click(function () {
        $(".btn-default").removeClass("active");
        $(this).addClass("active");
    });

    $("#searchBox").on("input", function () {
        var regex = new RegExp($(this).val(), "i");
        if ($(this).val()=="") {
            $(".btn-default").removeClass("disabled");
            $("#allBeacons").addClass("active");
        }
        else {
            $(".btn-default").removeClass("active");
            $(".btn-default").addClass("disabled");
```

```
            }
            $(".beaconContainer").isotope({ filter: function() {
                var name = $(this).find(".description").text();
                return name.match(regex);
            } })
        });

        $("#navBar").hover(function () {
            $("#navBackup").toggleClass("visibleNavElement");
            $("#navCurrent").toggleClass("visibleNavElement");
            $("#navNext").toggleClass("navHover");
            $(this).toggleClass("navBarHover");
        });

        $(document).ready(function() {

    $(".animsition").animsition({

        inClass               :    "fade-in-right-sm",
        outClass              :    "fade-out-right",
        inDuration            :     800,
        outDuration           :     500,
        linkElement           :    ".animsition-link",
        // e.g. linkElement    :
"a:not([target="_blank"]):not([href^=#])"
        loading               :     true,
        loadingParentElement  :    "body", //animsition wrapper element
        loadingClass          :    "animsition-loading",
        unSupportCss          : [ "animation-duration",
                                  "-webkit-animation-duration",
                                  "-o-animation-duration"
                                ],
        //"unSupportCss" option allows you to disable the "animsition"
in case the css property in the array is not supported by your
browser.
        //The default setting is to disable the "animsition" in a
browser that does not support "animation-duration".

        overlay               :     false,

        overlayClass          :    "animsition-overlay-slide",
        overlayParentElement  :    "body"
    });
});

        $("#logoutButton").click(function () {
            $("body").transition({scale: 0.8, opacity: 0});
        });
</script>

</body>
</html>
```

dump_prev.php

```php
<?php
      // check login status
      session_start();
      if (!isset($_SESSION['id'])) {
            // redirect to login.php
            $host = $_SERVER['HTTP_HOST'];
            $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
            header("Location: http://$host$uri/login.php");
      }

      $con = new mysqli("","","","");
      if (mysqli_connect_errno()) {
            echo "Failed to connect to MySQL: " .
mysqli_connect_error();
      }
      mysqli_query($con, "SET NAMES utf8");

      // retrieve category list
      $stmt = $con->prepare("SELECT id, description FROM
lyu1403_cms_location WHERE user = ?");
      $stmt->bind_param("s", $_SESSION['id']);
      $stmt->execute();
      $stmt->store_result();
      $stmt->bind_result($cat_id, $cat_name);

      // retrieve beacons
      $stmt2 = $con->prepare("SELECT id, title, category, photos FROM
lyu1403_cms_item_prev WHERE user = ?");
      $stmt2->bind_param("s", $_SESSION['id']);
      $stmt2->execute();
      $stmt2->store_result();
      $stmt2->bind_result($item_id, $item_name, $item_cat,
$item_photos);
?>
<!DOCTYPE html>
<html>
<head>
<title>DASHBOARD</title>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-
scale=1.0, maximum-scale=1.0, user-scalable=no" />
<script src="js/jquery-2.1.1.min.js"
type="text/javascript"></script>
<script src="js/bootstrap.min.js"></script>
<script src="js/isotope.pkgd.min.js"
type="text/javascript"></script>
<script src="js/jquery.colorbox-min.js"></script>
<script src="js/jquery.animsition.min.js"></script>
<script src="js/jquery.transit.min.js"></script>

<link rel="stylesheet" type="text/css"
href="css/bootstrap.min.css"></link>
<link rel="stylesheet" href="font-awesome-4.2.0/css/font-
awesome.min.css">
<link rel="stylesheet" type="text/css"
href="css/colorbox.css"></link>
```

```
<link rel="stylesheet" href="css/animsition.min.css">

<style>
     @font-face {
           font-family: Open Sans;
           src: url(fonts/OpenSans-Light.ttf);
     }

     * {
           font-family: Open Sans;
     }

     #titlepic {
           margin-top: 75px;
     }

     .container-fluid {
           margin-left: 5%;
           margin-right: 5%;
     }

     .item {
           width: 175px;
           height: 175px;
           margin: 5px;
           background: #FF6600;
           color: #000000;
           padding: 10px;
     }

     a.item:link, a.item:visited, a.item:active {
           text-decoration: none;
           color: #FFFFFF;
           text-shadow: 0px 0px 10px #000000;
     }

     a.item:hover {
           transition: all ease 0.25s;
           border: solid #000000 5px;
     }

     .buffer-2-5 {
           margin-top: 2.5%;
     }

     .buffer-5 {
           margin-top: 5%;
     }

     .operations {
           background: #CCCCCC;
     }

     .btn-group {
           margin-top: 15px;
           margin-bottom: 15px;
```

```
}

.main {
    color: #FFFFFF;
    background: repeating-linear-gradient(
        45deg,
        #000000,
        #000000 25px,
        #FF6600 25px,
        #FF6600 50px
    );
}

.beaconID {
    position: absolute;
    top: 5px;
    right: 5px;
    font-size: 15px;
}

.description {
    position: absolute;
    top: 20px;
    left: 10px;
    margin-right: 10px;
    font-size: 17.5px;
}

#navBar {
    background: #000000;
    color: #FFFFFF;
    text-align: center;
    font-size: 15px;
    vertical-align: middle;
    position: fixed;
    top: 0;
    margin: 0;
    padding-top: 5px;
    padding-bottom: 5px;
    width: 100%;
    z-index: 9999;
    -webkit-transition: ease 0.25s;
    -moz-transition: ease 0.25s;
    -o-transition: ease 0.25s;
    transition: ease 0.25s;
}

.navBarHover {
    padding-top: 15px !important;
    padding-bottom: 15px !important;
    background: #FF6600 !important;
}

.visibleNavElement {
    color: #FFFFFF !important;
}
```

```
      #navPrev {
            text-decoration: none;
            transition: ease 0.25s;
      }

      .navHover {
            text-decoration: underline !important;
      }

      #navCurrent, #navNext {
            color: #000000;
            transition: ease 0.25s;
      }

      .disabled {
            opacity: 0.2 !important;
      }

</style>

</head>
<body>


<div class="container-fluid vertical-center">
<div class="row">
<div class="col-md-12">
      <img id="titlepic" class="img-responsive" src="img/radar.png">
      <h1>DASHBOARD</h1>
      <div class="buffer"></div>
</div>
</div>
<div class="row">

<div class="col-sm-3">
<h2>OPERATIONS</h2>
      <div class="animsition">
            <div class="btn-group">
                  <input type="text" class="form-control"
id="searchBox" placeholder="SEARCH" autofocus>
            </div>
            <div class="buffer-2-5"></div>
            <div class="dropdown">
                  <button class="btn btn-warning btn-lg dropdown-
toggle" type="button" id="restoreData" data-toggle="dropdown">
                        <i class="fa fa-fire-extinguisher"></i>
                        RESTORE
                        <span class="caret"></span>
                  </button>
                  <ul class="dropdown-menu" role="menu" aria-
labelledby="restoreData">
                        <li role="presentation" class="dropdown-
header">TO CURRENT EXHIBITION</li>
                        <li role="presentation"><a role="menuitem"
tabindex="-1" href="commit.php?target=backup">CONFIRM</a></li>
```

```html
                    </ul>
            </div>
            <hr>
            <a class="btn btn-info btn-lg"
href="overview.php?type=prev">
                    <i class="fa fa-university"></i>
                    OVERVIEW
            </a>
            <hr>
            <a href="login.php?logout">
                    <button class="btn btn-primary btn-lg "
id="logoutButton">
                            <i class="fa fa-lock"></i>
                            LOG OUT
                    </button>
            </a>
            <div class="buffer-2-5"></div>
    </div>
</div>
<div class="col-sm-9">
<h2>ITEMS</h2>
<div class="animsition">
<div class="beaconFilter">

    <div class="btn-group">
            <a class="btn btn-default" href="#" data-filter="*"
class="current" id="allBeacons">ALL</a>
            <?php for ($i = 0; $i < $stmt->num_rows; $i++) {
                    $stmt->fetch(); ?>
            <a class="btn btn-default" href="#" data-filter=".<?php
echo $cat_id; ?>"><?php echo strtoupper($cat_name); ?></a>
            <?php } ?>
    </div>

    <!--div class="btn-group">
            <a class="btn btn-default" href="#" data-
filter=".main">UNDER MAINTENANCE</a>
    </div-->

    <br>

    <div class="beaconOrder btn-group">
            <button class="btn btn-default current" data-
filter="beaconID">ID</button>
            <button class="btn btn-default" data-
filter="description">TITLE</button>
    </div>

</div>

<div class="beaconContainer">

    <?php for ($i = 0; $i < $stmt2->num_rows; $i++) {
            $stmt2->fetch();
            $photos = json_decode($item_photos); ?>
    <a class="item <?php echo $item_cat; ?>"<?php if
```

```php
(count($photos) > 0) { ?> style="background: url(<?php echo
$photos[0]; ?>) no-repeat center center scroll;"<?php } ?>
href="preview.php?type=prev&id=<?php echo $item_id; ?>">
            <p class="beaconID hidden"><?php echo $item_id; ?></p>
            <p class="description"><?php echo
strtoupper($item_name); ?></p>
      </a>
      <?php } ?>

</div>
</div>
</div>
</div>
</div>
<div class="buffer-5"></div>


<div class="container-fluid" id="navBar">
      <div class="row">
            <div class="col-sm-4" id="navBackup">
                  <span>BACKUP</span>
            </div>
            <a href="dump.php" class="animsition-link">
                  <div class="col-sm-4 invisibleNavElement"
id="navCurrent">
                        <i class="fa fa-arrow-circle-right">
                        </i>
                        <span>CURRENT EXHIBITION</span>
                  </div>
            </a>
            <a href="dump_next.php" class="animsition-link">
                  <div class="col-sm-4 invisibleNavElement"
id="navNext">
                        <i class="fa fa-arrow-circle-right">
                        </i>
                        <span>NEXT EXHIBITION</span>
                  </div>
            </a>
      </div>
</div>

<script type="text/javascript">

$(window).load(function(){
    var $container = $(".beaconContainer");
    $container.isotope({
        filter: "*",
        sortBy: "beaconID",
        animationOptions: {
            duration: 750,
            easing: "linear",
            queue: false
        },
          getSortData: {
                beaconID: '.beaconID parseInt',
                description: '.description',
```

```
            }
    });

    $(".beaconFilter a").click(function(){
        $(".beaconFilter .current").removeClass("current");
        $(this).addClass("current");

        var selector = $(this).attr("data-filter");
        $container.isotope({
            filter: selector,
            sortBy: "beaconID",
            animationOptions: {
                duration: 750,
                easing: "linear",
                queue: false
            }
        });
        return false;
    });

     $(".beaconOrder button").click(function(){
        $(".beaconOrder .current").removeClass("current");
        $(this).addClass("current");

        var selector = $(this).attr("data-filter");
        $(".beaconContainer").isotope({
            sortBy: selector,
        });
        return false;
    });
});

    $("#allBeacons").addClass("active");
    $(".btn-default").click(function () {
        $(".btn-default").removeClass("active");
        $(this).addClass("active");
    });

    $("#searchBox").on("input", function () {
        var regex = new RegExp($(this).val(), "i");
        if ($(this).val()=="") {
            $(".btn-default").removeClass("disabled");
            $("#allBeacons").addClass("active");
        }
        else {
            $(".btn-default").removeClass("active");
            $(".btn-default").addClass("disabled");
        }
        $(".beaconContainer").isotope({ filter: function() {
            var name = $(this).find(".description").text();
            return name.match(regex);
        } })
    });

    $("#navBar").hover(function () {
        $("#navCurrent").toggleClass("visibleNavElement");
```

```
            $("#navNext").toggleClass("visibleNavElement");
            $("#navBackup").toggleClass("navHover");
            $(this).toggleClass("navBarHover");
        });

        $(document).ready(function() {

    $(".animsition").animsition({

        inClass               :    "fade-in-left-sm",
        outClass              :    "fade-out-left",
        inDuration            :     800,
        outDuration           :     500,
        linkElement           :    ".animsition-link",
        // e.g. linkElement    :
"a:not([target="_blank"]):not([href^=#])"
        loading               :     true,
        loadingParentElement  :    "body", //animsition wrapper element
        loadingClass          :    "animsition-loading",
        unSupportCss          : [ "animation-duration",
                                  "-webkit-animation-duration",
                                  "-o-animation-duration"
                                ],
        //"unSupportCss" option allows you to disable the "animsition"
in case the css property in the array is not supported by your
browser.
        //The default setting is to disable the "animsition" in a
browser that does not support "animation-duration".

        overlay               :     false,

        overlayClass          :    "animsition-overlay-slide",
        overlayParentElement  :    "body"
    });
});

        $("#logoutButton").click(function () {
            $("body").transition({scale: 0.8, opacity: 0});
        });
</script>

</body>
</html>
```

exhibition.php

```
<?php
    // check login status
    session_start();
    if (!isset($_SESSION['id'])) {
        // redirect to login.php
        $host = $_SERVER['HTTP_HOST'];
        $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
        header("Location: http://$host$uri/login.php");
    }
```

```php
      // handle form submission: update content
      if (isset($_REQUEST['submit'])) {
            $con = new mysqli("","","","");
            if (mysqli_connect_errno()) {
                  echo "Failed to connect to MySQL: " .
mysqli_connect_error();
            }
            $con->query("SET NAMES utf8");

            $stmt = $con->prepare("INSERT INTO lyu1403_cms_exhibition
(user, title_next, titleTC_next, description_next,
descriptionTC_next, image_next, floorplan_next) VALUES
(?, ?, ?, ?, ?, ?, ?) ON DUPLICATE KEY UPDATE title_next = ?,
titleTC_next = ?, description_next = ?, descriptionTC_next = ?,
image_next = ?, floorplan_next = ?");
            $stmt->bind_param("sssssssssssss", $_SESSION['id'],
$_REQUEST['title'], $_REQUEST['titleTC'], $_REQUEST['description'],
$_REQUEST['descriptionTC'], $_REQUEST['image'],
$_REQUEST['floorplan'], $_REQUEST['title'], $_REQUEST['titleTC'],
$_REQUEST['description'], $_REQUEST['descriptionTC'],
$_REQUEST['image'], $_REQUEST['floorplan']);
            $stmt->execute();

            // update locations
            $stmt = $con->prepare("DELETE FROM lyu1403_cms_location
WHERE user = ?");
            $stmt->bind_param("s", $_SESSION['id']);
            $stmt->execute();

            $categories = json_decode($_REQUEST['categories']);
            $stmt = $con->prepare("INSERT INTO lyu1403_cms_location
(user, id, description) VALUES (?, ?, ?)");
            for ($i = 0; $i < count($categories); $i++) {
                  $stmt->bind_param("sss", $_SESSION['id'],
$categories[$i]->abbr, $categories[$i]->name);
                  $stmt->execute();
            }

            // redirect to dump_next.php
            $host = $_SERVER['HTTP_HOST'];
            $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
            header("Location: http://$host$uri/dump_next.php");
      }
?>
<!DOCTYPE html>
<html>
<head>
<title>EXHIBITION SETTINGS</title>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-
scale=1.0, maximum-scale=1.0, user-scalable=no" />
<script src="js/jquery-2.1.1.min.js"
type="text/javascript"></script>
<script src="js/bootstrap.min.js"></script>
<script src="js/isotope.pkgd.min.js"
```

```
type="text/javascript"></script>
<script src="js/jquery.colorbox-min.js"></script>
<script src="js/jquery.animsition.min.js"></script>
<script src="js/jquery.transit.min.js"></script>

<link rel="stylesheet" type="text/css" href="css/bootstrap.min.css">
<link rel="stylesheet" href="font-awesome-4.2.0/css/font-
awesome.min.css">
<link rel="stylesheet" type="text/css" href="css/colorbox.css">
<link rel="stylesheet" href="css/animsition.min.css">

<style>
     @font-face {
          font-family: Open Sans;
          src: url(fonts/OpenSans-Light.ttf);
     }

     * {
          font-family: Open Sans;
     }

     #closeButton {
          margin-top: 75px;
          color: #000000;
     }

     #closeButton:hover {
          color: #000000;
     }

     #closeButton:active {
          color: #000000;
     }

     .container-fluid {
          margin-left: 5%;
          margin-right: 5%;
     }

     .buffer-2-5 {
          margin-top: 2.5%;
     }

     .buffer-5 {
          margin-top: 5%;
     }

     .operations {
          background: #CCCCCC;
     }

     .btn-group {
          margin-top: 15px;
          margin-bottom: 15px;
     }
```

```css
        .main {
                color: #FFFFFF;
                background: repeating-linear-gradient(
                        45deg,
                        #000000,
                        #000000 25px,
                        #FF6600 25px,
                        #FF6600 50px
                );
        }

        .disabled {
                opacity: 0.2 !important;
        }

</style>

</head>
<body>

<div class="animsition">
<div class="container-fluid vertical-center">
<div class="row">
<div class="col-md-12">
        <a href="dump_next.php" class="animsition-link"><i
id="closeButton" class="fa fa-sort-desc fa-5x"></i></a>
        <h1>SETTINGS</h1>
        <div class="buffer"></div>
</div>
</div>
<div class="row">
        <form class="form-horizontal" action="exhibition.php"
method="POST">
                <div class="alert alert-warning alert-dismissible fade in
hidden" id="image-alert" role="alert">
                        <strong>Error:</strong> The floor plan and/or image
cannot be loaded. Please check the URL you have provided.
                </div>

                <div class="form-group">
                        <label class="col-sm-2 control-label"
for="inputFloorPlan">FLOOR PLAN</label>

                        <div class="col-sm-10">
                                <input class="form-control"
id="inputFloorPlan" placeholder="LINK TO FLOOR PLAN" type="text"
name="floorplan" autofocus required>
                                <br><img class="hidden img-responsive img-
thumbnail" id="floorPlan">
                        </div>
                </div>

                <div class="form-group">
                        <label class="col-sm-2 control-label"
for="inputTitleTC">CHINESE TITLE</label>
```

```html
                <div class="col-sm-10">
                        <input class="form-control" id="inputTitleTC"
placeholder="CHINESE TITLE" type="text" name="titleTC" required>
                </div>
        </div>

        <div class="form-group">
                <label class="col-sm-2 control-label"
for="inputDescriptionTC">CHINESE DESCRIPTION</label>

                <div class="col-sm-10">
                        <textarea class="form-control"
id="inputDescriptionTC" placeholder="CHINESE DESCRIPTION" rows="5"
name="descriptionTC"></textarea>
                </div>
        </div>

        <div class="form-group">
                <label class="col-sm-2 control-label"
for="inputTitle">ENGLISH TITLE</label>

                <div class="col-sm-10">
                        <input class="form-control" id="inputTitle"
placeholder="ENGLISH TITLE" type="text" name="title" required>
                </div>
        </div>

        <div class="form-group">
                <label class="col-sm-2 control-label"
for="inputDescription">ENGLISH DESCRIPTION</label>

                <div class="col-sm-10">
                        <textarea class="form-control"
id="inputDescription" placeholder="ENGLISH DESCRIPTION" rows="5"
name="description"></textarea>
                </div>
        </div>

        <div class="form-group">
                <label class="col-sm-2 control-label"
for="inputImage">IMAGE</label>

                <div class="col-sm-10">
                        <input class="form-control" id="inputImage"
placeholder="LINK TO SPLASH SCREEN IMAGE" type="text" name="image">
                        <br><img class="hidden img-responsive img-
thumbnail" id="exhibitionImage">
                </div>
        </div>

        <div class="form-group">
                <label class="col-sm-2 control-label"
for="inputCategory">ITEM CATEGORIES</label>

                <div class="col-sm-5" id="cat-names">
                        <input class="form-control" id="inputCategory"
```

```
placeholder="NEW CATEGORY NAME" type="text">
                    </div>
                    <div class="col-sm-5" id="cat-abbrs">
                          <div class="input-group">
                                <input class="form-control"
id="inputAbbreviation" placeholder="ABBREVIATION" type="text">
                                <span class="input-group-btn">
                                      <button type="button" id="add-btn"
class="btn btn-info"><i class="fa fa-plus"></i></button>
                                </span>
                          </div>
                    </div>
            </div>

            <div id="category-list">
                  <div class="form-group hidden" id="cat-template">
                        <div class="col-sm-offset-2 col-sm-10">
                              <div class="row">
                                    <div class="col-sm-6">
                                          <input class="form-control
category-name" type="text" disabled>
                                    </div>
                                    <div class="col-sm-6">
                                          <div class="input-group">
                                                <input class="form-
control category-abbr" type="text" disabled>
                                                <span class="input-group-
btn">
                                                      <button
type="button" class="btn btn-danger remove-btn"><i class="fa fa-
times"></i></button>
                                                </span>
                                          </div>
                                    </div>
                              </div>
                        </div>
                  </div>
            </div>
            <input class="form-control hidden" type="text"
name="categories" id="categories">

            <div class="form-group">
                  <div class="col-sm-offset-2 col-sm-10">
                        <button class="btn btn-success btn-lg"
type="submit" name="submit">
                              <i class="fa fa-floppy-o"></i>
                              SAVE
                        </button>
                  </div>
            </div>
      </form>

</div>
<div class="buffer-5"></div>

</div>
```

```
</div>
<script>
      function addCategory(n, abbr) {
            var ele = $("#cat-
template").clone(true).removeClass("hidden").attr("id", "");
            ele.find(".category-name").val(n);
            ele.find(".category-abbr").val(abbr);
            ele.appendTo("#category-list");
      }

      $(document).ready(function() {

  $(".animsition").animsition({

    inClass               :    "fade-in-up-lg",
    outClass              :    "fade-out-down-lg",
    inDuration            :     800,
    outDuration           :     500,
    linkElement           :    ".animsition-link",
    // e.g. linkElement    :
"a:not([target="_blank"]):not([href^=#])"
    loading               :     true,
    loadingParentElement  :    "body", //animsition wrapper element
    loadingClass          :    "animsition-loading",
    unSupportCss          : [ "animation-duration",
                              "-webkit-animation-duration",
                              "-o-animation-duration"
                            ],
    //"unSupportCss" option allows you to disable the "animsition"
in case the css property in the array is not supported by your
browser.
    //The default setting is to disable the "animsition" in a
browser that does not support "animation-duration".

    overlay               :    false,

    overlayClass          :    "animsition-overlay-slide",
    overlayParentElement  :    "body"
  });

      // event handlers for image fields
      $("#inputFloorPlan, #inputImage").change(function(e) {
            $(e.target).siblings("img")
                  .addClass("hidden")
                  .attr("src", "");

            // check existence of image
            var tmpImg = new Image();
            tmpImg.onload = function() {
                  $(e.target).siblings("img")
                        .attr("src", $(e.target).val())
                        .removeClass("hidden");
            };
            tmpImg.src = $(e.target).val();
      });
```

```
        // form submit validation for images
        $("form").submit(function() {
              var valid = (!$("#floorPlan").hasClass("hidden")) &&
(!$("#exhibitionImage").hasClass("hidden"));
              if (!valid) {
                    $("#image-alert").removeClass("hidden");
              }
              else {
                    // construct category list
                    var arr = [];
                    $("#category-list > .form-
group:not(.hidden)").each(function(i) {
                          var obj = {'name': $(this).find('.category-
name').val(), 'abbr': $(this).find('.category-abbr').val()};
                          arr.push(obj);
                    });
                    $("#categories").val(JSON.stringify(arr));
              }
              return valid;
        });

        // remove category
        $(".remove-btn").click(function(e) {
              $(e.target).closest(".form-group").remove();
        });

        // add category
        $("#add-btn").click(function() {
              if ($("#inputCategory").val() == "" ||
$("#inputAbbreviation").val() == "") return;
              addCategory($("#inputCategory").val(),
$("#inputAbbreviation").val());
              $("#inputCategory").val("");
              $("#inputAbbreviation").val("");
        });

        // retrieve fields before modification
        <?php
              $con = new mysqli("","","","");
              if (mysqli_connect_errno()) {
                    echo "Failed to connect to MySQL: " .
mysqli_connect_error();
              }
              $con->query("SET NAMES utf8");

              $stmt = $con->prepare("SELECT title_next, titleTC_next,
description_next, descriptionTC_next, image_next, floorplan_next
FROM lyu1403_cms_exhibition WHERE user = ?");
              $stmt->bind_param("s", $_SESSION['id']);
              $stmt->execute();
              $stmt->store_result();

              if ($stmt->num_rows != 0) {
                    $stmt->bind_result($t, $tc, $d, $dc, $im, $fp);
                    $stmt->fetch();
                    echo '$("#inputTitle").val(' . json_encode($t) .
```

```
');';
                echo '$("#inputTitleTC").val(' . json_encode($tc) .
');';
                echo '$("#inputDescription").val(' .
json_encode($d) . ');';
                echo '$("#inputDescriptionTC").val(' .
json_encode($dc) . ');';
                echo '$("#inputImage").val(' . json_encode($im) .
').change();';
                echo '$("#inputFloorPlan").val(' .
json_encode($fp) . ').change();';
            }

            $stmt = $con->prepare("SELECT id, description FROM
lyu1403_cms_location WHERE user = ?");
            $stmt->bind_param("s", $_SESSION['id']);
            $stmt->execute();
            $stmt->store_result();
            $stmt->bind_result($a, $n);

            for ($i = 0; $i < $stmt->num_rows; $i++) {
                $stmt->fetch();
                echo 'addCategory(' . json_encode($n) . ', ' .
json_encode($a) . ');';
            }
    ?>
});
</script>

</body>
</html>
```

index.php

```
<?php
    // redirect to dump.php
    $host = $_SERVER['HTTP_HOST'];
    $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
    header("Location: http://$host$uri/dump.php");
?>
```

loading.php

```
<!DOCTYPE html>
<html>
<head>
    <title>MOBILE PREVIEW - NONE</title>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-
scale=1.0, maximum-scale=1.0, user-scalable=no" />
    <script src="js/jquery-2.1.1.min.js"
type="text/javascript"></script>
    <script src="js/bootstrap.min.js"></script>
    <link href="css/bootstrap.min.css" rel="stylesheet"
type="text/css">
    <link href="font-awesome/css/font-awesome.min.css"
rel="stylesheet">
    <style>
```

```
            @font-face {
                    font-family: Open Sans;
                    src: url(fonts/OpenSans-Light.ttf);
            }

            body {
                    font-family: Open Sans;
                    color: #FFFFFF;
                    background: #000000;
            }

            .container-fluid {
                    margin-left: 5%;
                    margin-right: 5%;
            }

            .buffer-2-5 {
                    padding: 2.5%;
            }

            .buffer-5 {
                    padding: 5%;
            }

            #copyright {
                    display: block;
                    position: fixed;
                    width: 100%;
                    bottom: 0;
                    padding: 10px;
                    text-align: center;
                    font-size: 15px;
            }

     </style>
</head>

<body>
     <div class="container-fluid">
          <div class="row">
                    <div class="buffer-5"></div>
                    <h1 class="col-xs-12">
                         <div class="text-center">
                                <i class="fa fa-spinner fa-pulse fa-2x
fa-fw"></i>

                                <div class="buffer-2-5"></div>
                                <?php if (isset($_REQUEST['lang']) &&
$_REQUEST['lang'] == 'tc') { ?>
                                載入展覽資料中，請稍候……
                                <?php } else { ?>
                                LOADING EXHIBITION DATA... PLEASE WAIT...
                                <?php } ?>
                         </div>
                    </h1>
          </div>
```

```
        </div>

        <div id="copyright">© 2015 Radar 2</div>
</body>
</html>
```

login.php

```php
<?php
      // logout: unset $_SESSION
      if (isset($_REQUEST['logout'])) {
            session_start();
            $_SESSION = array();
      }

      // login: submit to itself
      $valid = 1;
      if (isset($_REQUEST['id']) && isset($_REQUEST['password'])) {
            $con = new mysqli("","","","");
            if (mysqli_connect_errno()) {
                  echo "Failed to connect to MySQL: " .
mysqli_connect_error();
            }
            $con->query("SET NAMES utf8");

            $stmt = $con->prepare("SELECT apikey FROM
lyu1403_cms_auth WHERE username = ? AND password = ?");
            $stmt->bind_param("ss", $_REQUEST['id'],
$_REQUEST['password']);
            $stmt->execute();
            $stmt->store_result();

            if ($stmt->num_rows == 0) {
                  $valid = 0;
            }

            else {
                  $stmt->bind_result($apikey);
                  $stmt->fetch();

                  session_start();
                  $_SESSION['id'] = $apikey;

                  // redirect to dump.php
                  $host = $_SERVER['HTTP_HOST'];
                  $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
                  header("Location: http://$host$uri/dump.php");
            }
      }
?>

<html>
      <head>
            <title>LOGIN</title>
            <meta charset="utf-8" />
```

```
        <meta name="viewport" content="width=device-width,
initial-scale=1.0, maximum-scale=1.0, user-scalable=no" />
        <script src="js/jquery-2.1.1.min.js"></script>
        <script src="js/bootstrap.min.js"></script>
        <script src="js/jquery.animsition.min.js"></script>
        <script src="js/jquery.transit.min.js"></script>
        <!--
        <script src="js/jquery.easing.min.js"></script>
        <script src="js/supersized.3.2.7.min.js"></script>
        <script src="js/supersized.shutter.min.js"></script>
        -->

        <link rel="stylesheet" type="text/css"
href="css/bootstrap.min.css">
        <link rel="stylesheet" href="font-awesome-4.2.0/css/font-
awesome.min.css">
        <link rel="stylesheet" href="css/animsition.min.css">
        <!--
        <link rel="stylesheet" href="css/supersized.core.css">
        <link rel="stylesheet" href="css/supersized.shutter.css">
        -->

        <style>
            @font-face {
                font-family: Open Sans;
                src: url(fonts/OpenSans-Light.ttf);
            }

            * {
                font-family: Open Sans;
            }

            #titlepic {
                margin-top: 50px;
            }

            .buffer {
                padding-top: 5%;
            }

            html, body {
                min-height: 100%;
            }

            body {
                background: #000000;
            }

            #bgimg {
                display: block;
                position: fixed;
                z-index: -1;
                width: 100%;
                height: 100%;
                background: url(img/bg-sunset.png) no-repeat
center center fixed;
```

```css
                -webkit-background-size: cover;
                -moz-background-size: cover;
                -o-background-size: cover;
                background-size: cover;
            }

            .jumbotron {
                background: rgba(200, 200, 200, 0.8);
                min-width: 200px;
                max-width: 500px;
                margin-left: auto;
                margin-right: auto;
            }

            input[type="text"], input[type="password"] {
                background: rgba(255,255,255,0.4);
                transition: ease 0.25s;
            }

            input[type="text"]:focus,
input[type="password"]:focus {
                background: #FFFFFF;
            }

            #alertBar {
                display: none;
                background: #CC1D00;
                color: #FFFFFF;
                text-align: center;
                font-size: 20px;
                vertical-align: middle;
                position: fixed;
                top: 0;
                margin: 0;
                padding-top: 2.5px !important;
                padding-bottom: 2.5px !important;
                width: 100%;
                z-index: 9999;
                -webkit-transition: ease 0.25s;
                -moz-transition: ease 0.25s;
                -o-transition: ease 0.25s;
                transition: ease 0.25s;
            }

            #alertBar:hover {
                padding-top: 5px !important;
                padding-bottom: 5px !important;
            }

        </style>
        <!--
        <script type="text/javascript">

            jQuery(function($){

                $.supersized({
```

```
                            slide_interval: 2000,
                            transition: 1,
                            transition_speed: 500,
                            slide_links: 'blank',


                            // Components
                            slides: [
                                    {image : 'img/1.jpg'},
                                    {image : 'img/2.jpg'},
                                    {image : 'img/3.jpg'}
                            ]

                    });
                });

        </script>
        -->
    </head>

    <body>
        <?php
                date_default_timezone_set('Asia/Hong_Kong');
                $date = date('Y/m/d H:i:s');
        ?>

        <div class="animsition2" id="bgimg"></div>
        <div class="container vertical-center">
        <img id="titlepic" class="img-responsive"
src="img/radar.png">
        <div class="buffer"></div>
                <div class="jumbotron animsition" id="jumbotron">
                        <h1>LOG IN</h1>
                        <form role="form" id="loginForm"
action="login.php" method="POST"
onsubmit="$('#jumbotron').transition({scale: 1.2, opacity: 0});">
                                <div class="form-group">
                                        <label for="inputID">ID</label>
                                        <input type="text" class="form-
control input-lg" id="inputID" placeholder="ID" name="id" autofocus>
                                </div>
                                <div class="form-group">
                                        <label
for="inputPassword">PASSWORD</label>
                                        <input type="password" class="form-
control input-lg" id="inputPassword" placeholder="PASSWORD"
name="password">
                                </div>
                                <button type="submit" class="btn btn-
default"><i class="fa fa-lock"></i> LOG IN</button>
                        </form>
                </div>
        </div>

        <div id="alertBar">
```

```
                    INVALID CREDENTIALS
            </div>

            <script>
                $(document).ready(function() {

  $(".animsition").animsition({

    inClass                :    "zoom-in",
    outClass               :    "",
    inDuration             :     800,
    outDuration            :     500,
    linkElement            :    ".animsition-link",
    // e.g. linkElement    :
"a:not([target="_blank"]):not([href^=#])"
    loading                :     true,
    loadingParentElement   :    "body", //animsition wrapper element
    loadingClass           :    "animsition-loading",
    unSupportCss           : [ "animation-duration",
                               "-webkit-animation-duration",
                               "-o-animation-duration"
                             ],
    //"unSupportCss" option allows you to disable the "animsition"
in case the css property in the array is not supported by your
browser.
    //The default setting is to disable the "animsition" in a
browser that does not support "animation-duration".

    overlay                :    false,

    overlayClass           :    "animsition-overlay-slide",
    overlayParentElement   :    "body"
  });

  $(".animsition2").animsition({

    inClass                :    "fade-in",
    outClass               :    "",
    inDuration             :     1000,
    outDuration            :     100,
    linkElement            :    ".animsition-link",
    // e.g. linkElement    :
"a:not([target="_blank"]):not([href^=#])"
    loading                :     true,
    loadingParentElement   :    "body", //animsition wrapper element
    loadingClass           :    "animsition-loading",
    unSupportCss           : [ "animation-duration",
                               "-webkit-animation-duration",
                               "-o-animation-duration"
                             ],
    //"unSupportCss" option allows you to disable the "animsition"
in case the css property in the array is not supported by your
browser.
    //The default setting is to disable the "animsition" in a
browser that does not support "animation-duration".
```

```
   overlay                  :    false,

   overlayClass             :    "animsition-overlay-slide",
   overlayParentElement     :    "body"
  });
});

        <?php
             if (!$valid) {
                 echo '$("#alertBar").css({"display":
"block"})';
             }
        ?>
        </script>
    </body>
</html>
```

mobile_floorplan.php

```php
<?php
    $con = new mysqli("","","","");
    if (mysqli_connect_errno()) {
        echo "Failed to connect to MySQL: " .
mysqli_connect_error();
    }
    mysqli_query($con, "SET NAMES utf8");

    // check request headers
    if (!isset($_REQUEST['id'])) {
        echo "Unknown exhibition";
        exit(0);
    }

    if (isset($_REQUEST['x']) && isset($_REQUEST['y'])) {
        $x = $_REQUEST['x'];
        $y = $_REQUEST['y'];
    } else {
        $x = $y = 0;
    }

    // retrieve exhibition information
    $stmt = $con->prepare("SELECT floorplan FROM
lyu1403_cms_exhibition WHERE user = ?");
    $stmt->bind_param("s", $_REQUEST['id']);
    $stmt->execute();
    $stmt->store_result();
    $stmt->bind_result($floorplan);
    $stmt->fetch();

    if ($stmt->num_rows == 0) {
        echo "Invalid exhibition";
        exit(0);
    }
?>
<!DOCTYPE html>
```

```
<html>
<head>
      <title>FLOOR PLAN</title>
      <meta charset="UTF-8">
      <meta name="viewport" content="width=device-width, initial-
scale=1.0, maximum-scale=1.0" />
      <script src="js/jquery-2.1.1.min.js"
type="text/javascript"></script>
      <style>
      #pin {
            display: none;
      }

      #floorplan, #pin {
            position: absolute;
            top: 0;
            left: 0;
      }
      </style>
</head>

<body>
      <img id="floorplan" class="img-responsive" src="<?php echo
$floorplan ?>">
      <img id="pin" src="img/pin.png">
      <script>
            $("#pin").css({"display": "block", "left": <?php echo
$x; ?> - 12, "top": <?php echo $y; ?> - 38});
      </script>
</body>
</html>
```

mobile_overview.php

```
<?php
      $con = new mysqli("","","","");
      if (mysqli_connect_errno()) {
            echo "Failed to connect to MySQL: " .
mysqli_connect_error();
      }
      mysqli_query($con, "SET NAMES utf8");

      // check request headers
      if (isset($_REQUEST['lang'])) {
            $lang = $_REQUEST['lang'];
      } else {
            $lang = "en";
      }

      if (!isset($_REQUEST['id'])) {
            echo "Unknown exhibition";
            exit(0);
      }

      // retrieve exhibition information
```

```php
        $stmt = $con->prepare("SELECT title, titleTC, description,
descriptionTC, image FROM lyu1403_cms_exhibition WHERE user = ?");
        $stmt->bind_param("s", $_REQUEST['id']);
        $stmt->execute();
        $stmt->store_result();
        $stmt->bind_result($title, $titleTC, $description,
$descriptionTC, $image);
        $stmt->fetch();

        if ($stmt->num_rows == 0) {
                echo "Invalid exhibition";
                exit(0);
        }
?>
<!DOCTYPE html>
<html>
<head>
        <title>EXHIBITION OVERVIEW</title>
        <meta charset="UTF-8">
        <meta name="viewport" content="width=device-width, initial-
scale=1.0, maximum-scale=1.0, user-scalable=no" />
        <script src="js/jquery-2.1.1.min.js"
type="text/javascript"></script>
        <script src="js/bootstrap.min.js"></script>
        <link href="css/bootstrap.min.css" rel="stylesheet"
type="text/css">
        <link href="font-awesome-4.2.0/css/font-awesome.min.css"
rel="stylesheet">
        <style>

                /* Bootstrap overrides */
                .container-fluid {
                        margin: 0 !important;

                }

                @font-face {
                        font-family: Open Sans;
                        src: url(fonts/OpenSans-Light.ttf);
                }

                * {
                        font-family: Open Sans;
                        color: #FFFFFF;
                        background: #000000;
                }

                .container-fluid {
                        margin-left: 5%;
                        margin-right: 5%;
                }

                a.item:hover {
                        text-decoration: none;
                        color: #FFFFFF;
                }
```

```css
a.item:active {
    text-decoration: none;
    color: #FFFFFF;
}

.buffer-2-5 {
    padding-top: 2.5%;
}

.buffer-5 {
    padding-top: 5%;
}

.operations {
    background: #CCCCCC;
}

.btn-group {
    margin-top: 15px;
    margin-bottom: 15px;
}

.main {
    color: #FFFFFF;
    background: repeating-linear-gradient(
        45deg,
        #000000,
        #000000 25px,
        #FF6600 25px,
        #FF6600 50px
    );
}

.disabled {
    opacity: 0.2 !important;
}

#cover {
    display: block;
    position: relative;
    width: 100%;
    height: 200px;
    background: url(<?php echo $image; ?>) center center
no-repeat scroll;
    background-size: cover;
}

#title {
    display: block;
    position: absolute;
    bottom: 0px;
    color: #FFFFFF;
    background: transparent;
    font-size: 40px;
    text-shadow: 0px 0px 10px #000000;
```

```
                padding: 10px;
            }

            #description {
                padding-top: 40px;
                padding-bottom: 40px;
                margin-bottom: 0px;
            }
            /*
            #multimediaTitle, #ratingTitle, #commentsTitle {
                font-size: 30px;
            }
            */
            #rating {
                font-size: 25px;
            }

            #comments {
                font-size: 25px;
            }

    </style>
</head>

<body>
    <div id="cover">
        <div id="title"><?php echo lang == "tc" ? $titleTC :
$title; ?></div>
    </div>

    <?php
        if ($lang == "tc") {
            if (strlen($descriptionTC) > 0) {
                echo '<blockquote id="description">';
                echo nl2br($descriptionTC);
                echo '</blockquote>';
            }

            else {
                echo '<div class="buffer-5"></div>';
            }
        }

        else {
            if (strlen($description) > 0) {
                echo '<blockquote id="description">';
                echo nl2br($description);
                echo '</blockquote>';
            }

            else {
                echo '<div class="buffer-5"></div>';
            }
        }
    ?>
    <div class="buffer-5"></div>
```

```
</body>
</html>
```

mobile_preview.php

```php
<?php
      // check request headers
      if (isset($_REQUEST['lang'])) {
            $lang = $_REQUEST['lang'];
      } else {
            $lang = "en";
      }

      if (!isset($_REQUEST['id'])) {
            echo "Unknown item";
            exit(0);
      }

      $con = new mysqli("","","","");
      if (mysqli_connect_errno()) {
            echo "Failed to connect to MySQL: " .
mysqli_connect_error();
      }
      mysqli_query($con, "SET NAMES utf8");

      // retrieve and update visit log
      if (isset($_REQUEST['user'])) {
            $stmt = $con->prepare("SELECT last_visit FROM
lyu1403_cms_log WHERE installationID = ? AND item = ?");
            $stmt->bind_param("si", $_REQUEST["user"],
$_REQUEST["id"]);
            $stmt->execute();
            $stmt->store_result();
            if ($stmt->num_rows > 0) {
                  $stmt->bind_result($last_seen);
                  $stmt->fetch();
                  $last_seen = date("d/m/Y", $last_seen);
            }

            $stmt = $con->prepare("INSERT INTO lyu1403_cms_log
(installationID, item, last_visit) VALUES (?, ?, ?) ON DUPLICATE KEY
UPDATE last_visit = ?");
            $now = time();
            $stmt->bind_param("siii", $_REQUEST["user"],
$_REQUEST["id"], $now, $now);
            $stmt->execute();

            // get rating
            $stmt = $con->prepare("SELECT AVG(rating) FROM
lyu1403_cms_log WHERE item = ? AND rating IS NOT NULL");
            $stmt->bind_param("i", $_REQUEST["id"]);
            $stmt->execute();
            $stmt->store_result();
            if ($stmt->num_rows > 0) {
                  $stmt->bind_result($average);
```

```php
                $stmt->fetch();
            }
            if ($stmt->num_rows == 0 || $average == null) {
                $average = "-";
            }

            $stmt = $con->prepare("SELECT rating FROM lyu1403_cms_log
WHERE installationID = ? AND item = ? AND rating IS NOT NULL");
            $stmt->bind_param("si", $_REQUEST["user"],
$_REQUEST["id"]);
            $stmt->execute();
            $stmt->store_result();
            if ($stmt->num_rows > 0) {
                $stmt->bind_result($userRating);
                $stmt->fetch();
            }

            // get comments
            $stmt = $con->prepare("SELECT comment FROM
lyu1403_cms_log WHERE item = ? AND comment IS NOT NULL");
            $stmt->bind_param("i", $_REQUEST["id"]);
            $stmt->execute();
            $stmt->store_result();
            $comments = array();
            for ($i = 0; $i < $stmt->num_rows; $i++) {
                $stmt->bind_result($c);
                $stmt->fetch();
                array_push($comments, $c);
            }

            $stmt = $con->prepare("SELECT comment FROM
lyu1403_cms_log WHERE installationID = ?  AND item = ?");
            $stmt->bind_param("si", $_REQUEST["user"],
$_REQUEST["id"]);
            $stmt->execute();
            $stmt->store_result();
            if ($stmt->num_rows > 0) {
                $stmt->bind_result($userComment);
                $stmt->fetch();
            }
        }

    if ($lang == "tc") {
            $stmt = $con->prepare("SELECT uuid, major, minor, angle1,
angle2, locationX, locationY, titleTC, descriptionTC, photos,
audioTC, videoTC, youtubeTC FROM lyu1403_cms_item WHERE id = ?");
    } else {
            $stmt = $con->prepare("SELECT uuid, major, minor, angle1,
angle2, locationX, locationY, title, description, photos, audio,
video, youtube FROM lyu1403_cms_item WHERE id = ?");
    }
    $stmt->bind_param("i", $_REQUEST['id']);
    $stmt->execute();
    $stmt->store_result();

    if ($stmt->num_rows == 0) {
```

```php
                echo "Invalid item";
                exit(0);
        } else {
                $stmt->bind_result($uuid, $major, $minor, $angle1,
$angle2, $locationX, $locationY, $title, $description, $photos,
$audio, $video, $youtube);
                $stmt->fetch();
        }
?>
```
```html
<!DOCTYPE html>
<html>
<head>
        <title>MOBILE PREVIEW</title>
        <meta charset="UTF-8">
        <meta name="viewport" content="width=device-width, initial-
scale=1.0, maximum-scale=1.0, user-scalable=no" />
        <script src="js/jquery-2.1.1.min.js"
type="text/javascript"></script>
        <script src="js/bootstrap.min.js"></script>
        <link href="css/bootstrap.min.css" rel="stylesheet"
type="text/css">
        <link href="font-awesome-4.2.0/css/font-awesome.min.css"
rel="stylesheet">
        <style>

                /* Bootstrap overrides */
                .container-fluid {
                        margin: 0 !important;

                }

                @font-face {
                        font-family: Open Sans;
                        src: url(fonts/OpenSans-Light.ttf);
                }

                * {
                        font-family: Open Sans;
                        color: #FFFFFF;
                        background: #000000;
                }

                .container-fluid {
                        margin-left: 5%;
                        margin-right: 5%;
                }

                a.item:hover {
                        text-decoration: none;
                        color: #FFFFFF;
                }

                a.item:active {
                        text-decoration: none;
                        color: #FFFFFF;
                }
```

```css
            .buffer-2-5 {
                  padding-top: 2.5%;
            }

            .buffer-5 {
                  padding-top: 5%;
            }

            .operations {
                  background: #CCCCCC;
            }

            .btn-group {
                  margin-top: 15px;
                  margin-bottom: 15px;
            }

            .main {
                  color: #FFFFFF;
                  background: repeating-linear-gradient(
                        45deg,
                        #000000,
                        #000000 25px,
                        #FF6600 25px,
                        #FF6600 50px
                  );
            }

            .disabled {
                  opacity: 0.2 !important;
            }

            #cover {
                  display: block;
                  position: relative;
                  width: 100%;
                  height: 200px;
                  background:
url(http://appsrv.cse.cuhk.edu.hk/~phng2/fyp/images/pyramid.jpg)
center center no-repeat scroll;
                  background-size: cover;
            }

            #title {
                  display: block;
                  position: absolute;
                  bottom: 0px;
                  color: #FFFFFF;
                  background: transparent;
                  font-size: 40px;
                  text-shadow: 0px 0px 10px #000000;
                  padding: 10px;
            }

            #description {
```

220

```
                padding-top: 40px;
                padding-bottom: 40px;
                margin-bottom: 0px;
            }

            #rating, #comments, #last_seen {
                font-size: 25px;
            }

            .rating {
                font-size: 25px;
                text-align: center;
            }

            .rating:hover {
                cursor: pointer;
            }

            .rating > span {
                display: inline-block;
                width: 1.1em;
            }

            .rating > .selected {
                content: "\2605";
                color: gold;
            }
      </style>
</head>

<body>
      <div id="cover">
            <div id="title"><?php echo $title; ?></div>
      </div>

      <?php
            if (strlen($description) > 0) {
                echo '<blockquote id="description">';
                echo nl2br($description);
                echo '</blockquote>';
            }

            else {
                echo '<div class="buffer-5"></div>';
            }
      ?>

      <div class="container-fluid">

            <?php if (strlen($audio) + strlen($video) +
strlen($youtube) > 0) { ?>
            <div class="row">
                  <div class="col-sm-12">
                        <div id="multimedia">
                              <?php if (strlen($audio) > 0) {   ?>
                              <audio src="<?php echo $audio; ?>" <?php
```

```
echo isset($_REQUEST["autostart"]) ? "autoplay" : ""; ?>
controls ></audio><br />
                            <?php } ?>
                            <?php if (strlen($video) > 0) {  ?>
                            <video src="<?php echo $video; ?>"
controls></video><br />
                            <?php } ?>
                            <?php if (strlen($youtube) > 0) {  ?>
                            <div  class="embed-responsive embed-
responsive-16by9">
                                <iframe class="embed-responsive-
item" src="http://www.youtube.com/embed/<?php echo
$youtube; ?>"></iframe>
                            </div>
                            <?php } ?>
                    </div>
            </div>
        </div>
        <?php } ?>

        <div class="buffer-2-5"></div>

        <div class="row">
            <h2 class="col-xs-12" id="ratingTitle">
                RATING <span id="rating"><?php echo
round($average, 2); ?> / 5</span>
            </h2>
        </div>

        <div class="row">
            <div class="col-xs-12">
                <div class="rating">
                    <span>☆</span><span>☆</span><span>☆
</span><span>☆</span><span>☆</span>
                </div>
            </div>
        </div>

        <div class="buffer-2-5"></div>

        <div class="row">
            <h2 class="col-xs-12" id="commentsTitle">
                COMMENTS
            </h2>
        </div>

        <div class="row">
            <div class="col-xs-12">
                <div class="input-group">
                    <input class="form-control"
id="inputComment" placeholder="YOUR COMMENT" <?php if
(isset($userComment)) echo "value=\"" . $userComment . "\"" ?>
type="text">
                    <span class="input-group-btn">
                        <button type="button" id="comment-
```

```
btn" class="btn btn-info">SUBMIT</button>
                               </span>
                       </div>
                       <div id="comments">
                               <?php echo implode("<br>", $comments); ?>
                       </div>
               </div>
       </div>

       <?php if (isset($last_seen)) { ?>
       <div class="buffer-2-5"></div>

       <div class="row">
               <div id="last_seen" class="col-xs-12">
                       LAST VISITED ON <i><?php echo
$last_seen; ?></i>
               </div>
       </div>
       <?php } ?>

       <div class="buffer-5"></div>

    </div>

    <script>
    $(document).ready(function() {
           var photos = <?php echo $photos; ?>;
           var idx;
           if (photos.length > 0) {
                   idx = 0;
                   $("#cover").fadeTo("fast", "0.75", function() {
                           $("#cover").css({"background": "url(" +
photos[idx] + ") center center no-repeat scroll", "background-size":
"cover"});
                           $("#cover").fadeTo("fast", "1");
                   });

                   setInterval(function () {
                           idx = (idx + 1) % photos.length;
                           $("#cover").fadeTo("fast", "0.75", function()
{
                                   $("#cover").css({"background": "url(" +
photos[idx] + ") center center no-repeat scroll", "background-size":
"cover"});
                                   $("#cover").fadeTo("fast", "1");
                           });

                   }, 5000);
           }

           // preload all photos
           $.fn.preload = function() {
                   this.each(function() {
                           $('<img/>')[0].src = this;
                   });
           }
```

```
            $(photos).preload();

            // submit comment
            $("#comment-btn").click(function(e) {
                    if ($("#inputComment").val() == "") return;

                    $.get("../api/comment/?user=<?php echo
$_REQUEST['user']; ?>&id=<?php echo $_REQUEST['id']; ?>&comment=" +
encodeURIComponent($("#inputComment").val()),
                            function(data) {
                                    data = JSON.parse(data);
                                    if (data['status'] == 0) {
                                            $("#comment-btn").html("THANK
YOU").attr("disabled", "disabled");
                                    }
                            }
                    )
            });

            // submit rating
            $(".rating > span").click(function(e) {
                    var rating = $(e.target).prevAll().size() + 1;
                    $(".rating > span").removeClass("selected");
                    $(e.target).addClass("selected");
                    $(e.target).prevAll().addClass("selected");

                    $.get("../api/rate/?user=<?php echo
$_REQUEST['user']; ?>&id=<?php echo $_REQUEST['id']; ?>&rating=" +
rating,
                            function(data) {
                                    console.log("Rated " + rating);
                            }
                    )
            });

            $(".rating > span:lt(<?php echo
$userRating; ?>)").addClass("selected");
        });
    </script>
</body>
</html>
```

modify.php

```
<?php
    // check login status
    session_start();
    if (!isset($_SESSION['id'])) {
        // redirect to login.php
        $host = $_SERVER['HTTP_HOST'];
        $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
        header("Location: http://$host$uri/login.php");
    }
```

```php
        // check existence of ID
        if (!isset($_REQUEST['id'])) {
                // redirect to dump_next.php
                $host = $_SERVER['HTTP_HOST'];
                $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
                header("Location: http://$host$uri/dump_next.php");
        }

        // handle submission: update item_next
        if (isset($_REQUEST['submit'])) {
                $con = new mysqli("","","","");
                if (mysqli_connect_errno()) {
                        echo "Failed to connect to MySQL: " .
mysqli_connect_error();
                }
                $con->query("SET NAMES utf8");

                $stmt = $con->prepare("UPDATE lyu1403_cms_item_next SET
uuid = ?, major = ?, minor = ?, angle1 = ?, angle2 = ?, locationX
= ?, locationY = ?, category = ?, title = ?, titleTC = ?,
description = ?, descriptionTC = ?, photos = ?, audio = ?, video
= ?, youtube = ?, audioTC = ?, videoTC = ?, youtubeTC = ? WHERE id
= ? AND user = ?");
                $stmt->bind_param("siiiiiissssssssssis",
$_REQUEST["uuid"], $_REQUEST["major"], $_REQUEST["minor"],
$_REQUEST["angle1"], $_REQUEST["angle2"], $_REQUEST["locationX"],
$_REQUEST["locationY"], $_REQUEST["category"], $_REQUEST["title"],
$_REQUEST["titleTC"], $_REQUEST["description"],
$_REQUEST["descriptionTC"], $_REQUEST["photos"], $_REQUEST["audio"],
$_REQUEST["video"], $_REQUEST["youtube"], $_REQUEST["audioTC"],
$_REQUEST["videoTC"], $_REQUEST["youtubeTC"], $_REQUEST["id"],
$_SESSION["id"]);
                $stmt->execute();

                // redirect to dump_next.php
                $host = $_SERVER['HTTP_HOST'];
                $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
                header("Location: http://$host$uri/dump_next.php");
        }

        // not submission: retrieve original fields
        else {
                $con = new mysqli("","","","");
                if (mysqli_connect_errno()) {
                        echo "Failed to connect to MySQL: " .
mysqli_connect_error();
                }
                $con->query("SET NAMES utf8");

                $stmt = $con->prepare("SELECT uuid, major, minor, angle1,
angle2, locationX, locationY, category, title, titleTC, description,
descriptionTC, photos, audio, video, youtube, audioTC, videoTC,
youtubeTC FROM lyu1403_cms_item_next WHERE id = ? AND user = ?");
                $stmt->bind_param("is", $_REQUEST['id'],
$_SESSION["id"]);
                $stmt->execute();
```

```php
            $stmt->store_result();

            if ($stmt->num_rows == 0) {
                    // invalid ID: redirect to dump_next.php
                    $host = $_SERVER['HTTP_HOST'];
                    $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
                    header("Location: http://$host$uri/dump_next.php");
            } else {
                    $stmt->bind_result($uuid, $major, $minor, $angle1,
$angle2, $locationX, $locationY, $category, $title, $titleTC,
$description, $descriptionTC, $photos, $audio, $video, $youtube,
$audioTC, $videoTC, $youtubeTC);
                    $stmt->fetch();
            }
      }

      // load exhibition info
      $con = new mysqli("","","","");
      if (mysqli_connect_errno()) {
            echo "Failed to connect to MySQL: " .
mysqli_connect_error();
      }
      $con->query("SET NAMES utf8");

      $stmt = $con->prepare("SELECT floorplan_next FROM
lyu1403_cms_exhibition WHERE user = ?");
      $stmt->bind_param("s", $_SESSION['id']);
      $stmt->execute();
      $stmt->store_result();

      $status = 0;
      if ($stmt->num_rows != 0) {
            $stmt->bind_result($fp);
            $stmt->fetch();
      } else {
            $status = 1;
      }

      $categories = array();
      $stmt = $con->prepare("SELECT id, description FROM
lyu1403_cms_location WHERE user = ?");
      $stmt->bind_param("s", $_SESSION['id']);
      $stmt->execute();
      $stmt->store_result();
      $stmt->bind_result($a, $n);

      for ($i = 0; $i < $stmt->num_rows; $i++) {
            $stmt->fetch();
            $obj = array("abbr" => $a, "name" => $n);
            array_push($categories, $obj);
      }
?>
<!DOCTYPE html>
<html>
<head>
<title>MODIFY</title>
```

```
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-
scale=1.0, maximum-scale=1.0, user-scalable=no" />
<script src="js/jquery-2.1.1.min.js"
type="text/javascript"></script>
<script src="js/bootstrap.min.js"></script>
<script src="js/isotope.pkgd.min.js"
type="text/javascript"></script>
<script src="js/jquery.colorbox-min.js"></script>
<script src="js/jquery.animsition.min.js"></script>
<script src="js/jquery.transit.min.js"></script>

<link rel="stylesheet" type="text/css"
href="css/bootstrap.min.css"></link>
<link rel="stylesheet" href="font-awesome-4.2.0/css/font-
awesome.min.css">
<link rel="stylesheet" type="text/css"
href="css/colorbox.css"></link>
<link rel="stylesheet" href="css/animsition.min.css">

<style>
     @font-face {
          font-family: Open Sans;
          src: url(fonts/OpenSans-Light.ttf);
     }

     * {
          font-family: Open Sans;
     }

     #closeButton {
          margin-top: 75px;
          color: #000000;
     }

     #closeButton:hover {
          color: #000000;
     }

     #closeButton:active {
          color: #000000;
     }

     .container-fluid {
          margin-left: 5%;
          margin-right: 5%;
     }

     .buffer-2-5 {
          padding-top: 2.5%;
     }

     .buffer-5 {
          padding-top: 5%;
     }
```

```
      .operations {
            background: #CCCCCC;
      }

      .btn-group {
            margin-top: 15px;
            margin-bottom: 15px;
      }

      .main {
            color: #FFFFFF;
            background: repeating-linear-gradient(
                  45deg,
                  #000000,
                  #000000 25px,
                  #FF6600 25px,
                  #FF6600 50px
            );
      }

      .disabled {
            opacity: 0.2 !important;
      }

      #pin {
            display: none;
            position: absolute;
      }

      #floorplanOverlay {
            display: block;
            position: absolute;
            top: 0;
            left: 0;
      }

</style>

</head>
<body>

<div class="animsition">
<div class="container-fluid vertical-center">
<div class="row">
<div class="col-md-12">
      <a href="dump_next.php" class="animsition-link"><i
id="closeButton" class="fa fa-sort-desc fa-5x"></i></a>
      <h1>MODIFY</h1>
      <div class="buffer"></div>
</div>
</div>
<div class="row">
      <form class="form-horizontal" method="POST">
            <div class="form-group">
                  <label class="col-sm-2 control-label"
for="inputTitleTC">CHINESE TITLE</label>
```

```
                    <div class="col-sm-10">
                        <input class="form-control" id="inputTitleTC"
placeholder="CHINESE TITLE" type="text" name="titleTC" autofocus
required>
                    </div>
            </div>

            <div class="form-group">
                    <label class="col-sm-2 control-label"
for="inputTitle">ENGLISH TITLE</label>

                    <div class="col-sm-10">
                        <input class="form-control" id="inputTitle"
placeholder="ENGLISH TITLE" type="text" name="title" required>
                    </div>
            </div>

            <div class="form-group">
                    <label class="col-sm-2 control-label"
for="inputLocationX">LOCATION</label>

                    <div class="col-sm-5">
                        <input class="form-control"
id="inputLocationX" placeholder="" type="text" name="locationX"
readonly>
                    </div>
                    <div class="col-sm-5">
                        <input class="form-control"
id="inputLocationY" placeholder="" type="text" name="locationY"
readonly>
                    </div>

                    <div class="col-sm-offset-2 col-sm-10">
                    <?php if ($status == 0) { ?>
                        <br><img id="floorplan" src="<?php echo
$fp ?>">
                        <img id="pin" src="img/pin.png">
                        <div id="floorplanOverlay"></div>
                    <?php } else { ?>
                        <div class="alert alert-warning alert-
dismissible fade in" id="image-alert" role="alert">
                            <strong>Warning:</strong> The floor plan
has not been set yet. Please add it in <a
href="exhibition.php">exhibition settings page</a>.
                        </div>
                    <?php } ?>
                    </div>
            </div>

            <div class="form-group">
                    <label class="col-sm-2 control-label"
for="inputCategory">CATEGORY</label>

                    <div class="col-sm-10">
                        <?php if (count($categories) == 0) { ?>
```

```
                              <div class="alert alert-info alert-
dismissible fade in" id="image-alert" role="alert">
                                  <strong>Information:</strong> No
item categories has not been set yet. You may set them in <a
href="exhibition.php">exhibition settings page</a>.
                              </div>
                      <?php }?>
                      <select class="form-control" name="category"
id="inputCategory">
                          <option value="">Select a
category</option>
                      <?php for ($i = 0; $i < count($categories);
$i++) { ?>
                          <option value="<?php echo
$categories[$i]['abbr']; ?>"><?php echo
$categories[$i]['name']; ?></option>
                      <?php } ?>
                      </select>
                  </div>
          </div>

          <div class="form-group">
                  <label class="col-sm-2 control-label"
for="inputUuid">UUID</label>

                  <div class="col-sm-10">
                          <input class="form-control" id="inputUuid"
placeholder="UUID" type="text" name="uuid">
                  </div>
          </div>

          <div class="form-group">
                  <label class="col-sm-2 control-label"
for="inputMajor">MAJOR</label>

                  <div class="col-sm-10">
                          <input class="form-control" id="inputMajor"
placeholder="MAJOR" type="number" name="major">
                  </div>
          </div>

          <div class="form-group">
                  <label class="col-sm-2 control-label"
for="inputMinor">MINOR</label>

                  <div class="col-sm-10">
                          <input class="form-control" id="inputMinor"
placeholder="MINOR" type="number" name="minor">
                  </div>
          </div>

          <div class="form-group">
                  <label class="col-sm-2 control-label"
for="inputAngle1">COMPASS ANGLE</label>
                  <div class="col-sm-5">
                          <input class="form-control" id="inputAngle1"
```

```
min="0" max="360" value="0" type="number" name="angle1">
                </div>
                <div class="col-sm-5">
                        <input class="form-control" id="inputAngle2"
min="0" max="360" value="360" type="number" name="angle2">
                </div>
        </div>

        <div class="form-group">
                <label class="col-sm-2 control-label"
for="inputPhotos">PHOTOS</label>

                <div class="col-sm-10">
                        <div class="input-group">
                                <input class="form-control"
id="inputPhotos" placeholder="LINK TO A PHOTO" type="text">
                                <span class="input-group-btn">
                                        <button type="button" id="add-btn"
class="btn btn-info"><i class="fa fa-plus"></i></button>
                                </span>
                        </div>
                </div>
        </div>

        <div id="photo-list">
                <div class="form-group hidden" id="photo-template">
                        <div class="col-sm-offset-2 col-sm-10">
                                <div class="row">
                                        <div class="col-sm-12">
                                                <div class="input-group">
                                                        <input class="form-
control photo-link" type="text" disabled>
                                                        <span class="input-group-
btn">
                                                                <button
type="button" class="btn btn-danger remove-btn"><i class="fa fa-
times"></i></button>
                                                        </span>
                                                </div>
                                        </div>
                                        <br><img class="hidden photo-
preview img-responsive img-thumbnail">
                                </div>
                        </div>
                </div>
        </div>
        <input class="form-control hidden" type="text"
name="photos" id="photos">

        <div class="form-group">
                <label class="col-sm-2 control-label"
for="inputDescriptionTC">CHINESE DESCRIPTION</label>

                <div class="col-sm-10">
                        <textarea class="form-control"
id="inputDescriptionTC" placeholder="CHINESE DESCRIPTION" rows="5"
```

```
name="descriptionTC"></textarea>
                </div>
        </div>

        <div class="form-group">
            <label class="col-sm-2 control-label"
for="inputAudioTC">CHINESE AUDIO</label>

                <div class="col-sm-10">
                    <input class="form-control" id="inputAudioTC"
placeholder="LINK TO AN AUDIO CLIP" type="text" name="audioTC">
                </div>
        </div>

        <div class="form-group">
            <label class="col-sm-2 control-label"
for="inputVideoTC">CHINESE VIDEO</label>

                <div class="col-sm-10">
                    <input class="form-control" id="inputVideoTC"
placeholder="LINK TO A VIDEO CLIP" type="text" name="videoTC">
                </div>
        </div>

        <div class="form-group">
            <label class="col-sm-2 control-label"
for="inputYoutubeTC">CHINESE YOUTUBE</label>

                <div class="col-sm-10">
                    <input class="form-control"
id="inputYoutubeTC" placeholder="LINK TO A YOUTUBE VIDEO"
type="text">
                    <div class="alert alert-warning alert-
dismissible fade in hidden" id="yt-tc-alert" role="alert">
                        <strong>Error:</strong> The YouTube link
cannot be recognized.
                </div>

                    <input class="form-control hidden" type="text"
name="youtubeTC" id="youtubeTC">
                </div>
        </div>

        <div class="form-group">
            <label class="col-sm-2 control-label"
for="inputDescription">ENGLISH DESCRIPTION</label>

                <div class="col-sm-10">
                    <textarea class="form-control"
id="inputDescription" placeholder="ENGLISH DESCRIPTION" rows="5"
name="description"></textarea>
                </div>
        </div>

        <div class="form-group">
            <label class="col-sm-2 control-label"
```

```html
for="inputAudio">ENGLISH AUDIO</label>

                <div class="col-sm-10">
                        <input class="form-control" id="inputAudio"
placeholder="LINK TO AN AUDIO CLIP" type="text" name="audio">
                </div>
        </div>

        <div class="form-group">
                <label class="col-sm-2 control-label"
for="inputVideo">ENGLISH VIDEO</label>

                <div class="col-sm-10">
                        <input class="form-control" id="inputVideo"
placeholder="LINK TO A VIDEO CLIP" type="text" name="video">
                </div>
        </div>

        <div class="form-group">
                <label class="col-sm-2 control-label"
for="inputYoutube">ENGLISH YOUTUBE</label>

                <div class="col-sm-10">
                        <input class="form-control" id="inputYoutube"
placeholder="LINK TO A YOUTUBE VIDEO" type="text">
                        <div class="alert alert-warning alert-
dismissible fade in hidden" id="yt-alert" role="alert">
                                <strong>Error:</strong> The YouTube link
cannot be recognized.
                        </div>

                        <input class="form-control hidden" type="text"
name="youtube" id="youtube">
                </div>
        </div>

        <div class="form-group">
                <div class="col-sm-offset-2 col-sm-10">
                        <button class="btn btn-success btn-lg"
type="submit" name="submit">
                                <i class="fa fa-floppy-o"></i>
                                SAVE
                        </button>
                </div>
        </div>
    </form>

</div>
<div class="buffer-5"></div>

</div>
</div>
<script>
    function addPhoto(url) {
            var ele = $("#photo-
template").clone(true).removeClass("hidden").attr("id", "");
```

```
            ele.find(".photo-link").val(url);
            ele.appendTo("#photo-list");

            // check existence of image
            var tmpImg = new Image();
            tmpImg.onload = function() {
                  ele.find("img")
                          .attr("src", url)
                          .removeClass("hidden");
            };
            tmpImg.src = url;
      }

      // YouTube link recognizer from
http://stackoverflow.com/a/8260383
      function youtube_parse(url){
            var regExp =
/^.*((youtu.be\/)|(v\/)|(\/u\/\w\/)|(embed\/)|(watch\?))\??v?=?([^#\
&\?]*).*/;
            var match = url.match(regExp);
            if (match&&match[7].length==11) {
                  return match[7];
            } else {
                  return false;
            }
      }

      $(document).ready(function() {

  $(".animsition").animsition({

    inClass               :   "fade-in-up-lg",
    outClass              :   "fade-out-down-lg",
    inDuration            :    800,
    outDuration           :    500,
    linkElement           :   ".animsition-link",
    // e.g. linkElement   :
"a:not([target="_blank"]):not([href^=#])"
    loading               :    true,
    loadingParentElement  :   "body", //animsition wrapper element
    loadingClass          :   "animsition-loading",
    unSupportCss          : [ "animation-duration",
                              "-webkit-animation-duration",
                              "-o-animation-duration"
                            ],
    //"unSupportCss" option allows you to disable the "animsition"
in case the css property in the array is not supported by your
browser.
    //The default setting is to disable the "animsition" in a
browser that does not support "animation-duration".

    overlay               :    false,

    overlayClass          :   "animsition-overlay-slide",
    overlayParentElement  :   "body"
  });
```

```
    // form submit validation for images
    $("form").submit(function() {
        // construct image list
        var arr = [];
        $("#photo-list > .form-
group:not(.hidden)").each(function(i) {
            arr.push($(this).find('.photo-link').val());
        });
        $("#photos").val(JSON.stringify(arr));
        return true;
    });

    // validate YouTube links
    $("#inputYoutube").change(function (e) {
        $("#yt-alert").addClass("hidden");
        if ($(e.target).val() == "") return;
        var videoID = youtube_parse($(e.target).val());
        if (videoID === false) {
            $("#yt-alert").removeClass("hidden");
        } else {
            $("#youtube").val(videoID);
        }
    });

    $("#inputYoutubeTC").change(function (e) {
        $("#yt-tc-alert").addClass("hidden");
        if ($(e.target).val() == "") return;
        var videoID = youtube_parse($(e.target).val());
        if (videoID === false) {
            $("#yt-tc-alert").removeClass("hidden");
        } else {
            $("#youtubeTC").val(videoID);
        }
    });

    // remove photo
    $(".remove-btn").click(function(e) {
        $(e.target).closest(".form-group").remove();
    });

    // add photo
    $("#add-btn").click(function() {
        if ($("#inputPhotos").val() == "") return;
        addPhoto($("#inputPhotos").val());
        $("#inputPhotos").val("");
    });

    function resizeWindow() {
        $("#floorplanOverlay").css({"height":
$("#floorplan").height() + "px", "width":  $("#floorplan").width() +
"px"});
    }

    $(window).resize(resizeWindow());
```

```
      // floor plan: location selection
      $("#floorplanOverlay").click(function(e) {
           var offset = $(this).offset();
           $("#inputLocationX").val(Math.round(e.pageX -
offset.left));
           $("#inputLocationY").val(Math.round(e.pageY -
offset.top));

           // 12 and 38 are the half of width and full height of the
pin respectively
           $("#pin").css({"display": "block", "left":
Math.round(e.pageX - offset.left) - 12, "top": Math.round(e.pageY -
offset.top) - 38});
      });

      // set original fields
      $("#inputTitleTC").val(<?php echo json_encode($titleTC); ?>);
      $("#inputTitle").val(<?php echo json_encode($title); ?>);
      $("#inputLocationX").val(<?php echo
json_encode($locationX); ?>);
      $("#inputLocationY").val(<?php echo
json_encode($locationY); ?>);
      $("#pin").css({"display": "block", "left":
parseInt($("#inputLocationX").val()) + 4, "top":
parseInt($("#inputLocationY").val()) - 16});
      $("#inputCategory").val(<?php echo json_encode($category); ?>);
      $("#inputUuid").val(<?php echo json_encode($uuid); ?>);
      $("#inputMajor").val(<?php echo json_encode($major); ?>);
      $("#inputMinor").val(<?php echo json_encode($minor); ?>);
      $("#inputAngle1").val(<?php echo json_encode($angle1); ?>);
      $("#inputAngle2").val(<?php echo json_encode($angle2); ?>);
      $("#inputDescriptionTC").val(<?php echo
json_encode($descriptionTC); ?>);
      $("#inputDescription").val(<?php echo
json_encode($description); ?>);
      var photos = <?php echo $photos; ?>;
      for (i in photos) {
           addPhoto(photos[i]);
      }
      $("#inputAudio").val(<?php echo json_encode($audio); ?>);
      $("#inputAudioTC").val(<?php echo json_encode($audioTC); ?>);
      $("#inputVideo").val(<?php echo json_encode($video); ?>);
      $("#inputVideoTC").val(<?php echo json_encode($videoTC); ?>);
      $("#youtube").val(<?php echo json_encode($youtube); ?>);
      $("#youtubeTC").val(<?php echo json_encode($youtubeTC); ?>);
      <?php if (strlen($youtube) > 0) { ?>
      $("#inputYoutube").val("https://www.youtube.com/watch?v=" +
"<?php echo $youtube; ?>");
      <? } ?>
      <?php if (strlen($youtubeTC) > 0) { ?>
      $("#inputYoutubeTC").val("https://www.youtube.com/watch?v=" +
"<?php echo $youtubeTC; ?>");
      <? } ?>

      resizeWindow();
});
```

```
</script>

</body>
</html>
```

overview.php

```
<?php
     // check login status
     session_start();
     if (!isset($_SESSION['id'])) {
          // redirect to login.php
          $host = $_SERVER['HTTP_HOST'];
          $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
          header("Location: http://$host$uri/login.php");
     }

     // check request headers
     if (isset($_REQUEST['lang'])) {
          $lang = $_REQUEST['lang'];
     } else {
          $lang = "en";
     }

     if (isset($_REQUEST['type'])) {
          $table = $_REQUEST['type'];
     } else {
          $table = "";
     }

     $con = new mysqli("","","","");
     if (mysqli_connect_errno()) {
          echo "Failed to connect to MySQL: " .
mysqli_connect_error();
     }
     mysqli_query($con, "SET NAMES utf8");

     // choose table to access
     if ($table == "prev") {
          $stmt = $con->prepare("SELECT title_prev, titleTC_prev,
description_prev, descriptionTC_prev, image_prev FROM
lyu1403_cms_exhibition WHERE user = ?");
     } elseif ($table == "next") {
          $stmt = $con->prepare("SELECT title_next, titleTC_next,
description_next, descriptionTC_next, image_next FROM
lyu1403_cms_exhibition WHERE user = ?");
     } else {
          $stmt = $con->prepare("SELECT title, titleTC,
description, descriptionTC, image FROM lyu1403_cms_exhibition WHERE
user = ?");
     }
     $stmt->bind_param("s", $_SESSION["id"]);
     $stmt->execute();
     $stmt->store_result();
```

```php
      if ($stmt->num_rows == 0) {
            // redirect to last page
            $host = $_SERVER['HTTP_HOST'];
            $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
            header("Location: http://$host$uri/dump" . $table == "" ?
".php" : "_" . $table . ".php");
      } else {
            $stmt->bind_result($title, $titleTC, $description,
$descriptionTC, $image);
            $stmt->fetch();
      }
?>
<!DOCTYPE html>
<html>
<head>
      <title>OVERVIEW</title>
      <meta charset="UTF-8">
      <meta name="viewport" content="width=device-width, initial-
scale=1.0, maximum-scale=1.0, user-scalable=no" />
      <script src="js/jquery-2.1.1.min.js"
type="text/javascript"></script>
      <script src="js/bootstrap.min.js"></script>
      <script src="js/isotope.pkgd.min.js"
type="text/javascript"></script>
      <script src="js/jquery.colorbox-min.js"></script>
      <script src="js/jquery.animsition.min.js"></script>
      <script src="js/jquery.transit.min.js"></script>
      <link href="css/bootstrap.min.css" rel="stylesheet"
type="text/css">
      <link href="font-awesome-4.2.0/css/font-awesome.min.css"
rel="stylesheet">
      <link href="css/colorbox.css" rel="stylesheet" type="text/css">
      <link href="css/animsition.min.css" rel="stylesheet">
      <style>
          @font-face {
                font-family: Open Sans;
                src: url(fonts/OpenSans-Light.ttf);
          }

          * {
                font-family: Open Sans;
          }

          #closeButton {
                margin-top: 75px;
                color: #000000;
          }

          #closeButton:hover {
                color: #000000;
          }

          #closeButton:active {
                color: #000000;
          }
```

```css
.container-fluid {
      margin-left: 5%;
      margin-right: 5%;
}

a.item:hover {
      text-decoration: none;
      color: #FFFFFF;
}

a.item:active {
      text-decoration: none;
      color: #FFFFFF;
}

.buffer-2-5 {
      padding-top: 2.5%;
}

.buffer-5 {
      padding-top: 5%;
}

.operations {
      background: #CCCCCC;
}

.btn-group {
      margin-top: 15px;
      margin-bottom: 15px;
}

.main {
      color: #FFFFFF;
      background: repeating-linear-gradient(
            45deg,
            #000000,
            #000000 25px,
            #FF6600 25px,
            #FF6600 50px
      );
}

.disabled {
      opacity: 0.2 !important;
}

#cover {
      display: block;
      position: relative;
      width: 100%;
      height: 400px;
      background: url(<?php echo $image; ?>) center center no-repeat scroll;
      background-size: cover;
}
```

```
            #title {
                    display: block;
                    position: absolute;
                    bottom: 0px;
                    color: #FFFFFF;
                    font-size: 40px;
                    text-shadow: 0px 0px 10px #000000;
                    padding: 10px;
            }

            #description {
                    padding-top: 40px;
                    padding-bottom: 40px;
            }

            #multimediaTitle, #ratingTitle, #commentsTitle {
                    font-size: 30px;
                    text-align: right;
            }

            #rating {
                    font-size: 30px;
            }

            #comments {
                    font-size: 25px;
            }

        </style>
</head>

<body>
        <div class="container-fluid vertical-center animsition">
            <div class="row">
                    <div class="col-md-12">
                            <a href="dump<?php echo $table == "" ?
".php" : "_" . $table . ".php"; ?>" class="animsition-link">
                                    <i class="fa fa-sort-desc fa-5x"
id="closeButton"></i>
                            </a>

                            <h1>OVERVIEW</h1>

                            <div class="buffer"></div>
                    </div>
            </div>

            <div class="row">
                    <div class="col-sm-3">
                            <h2>OPERATIONS</h2>

                            <div class="buffer-2-5"></div>
                            <a class="btn btn-info btn-lg"
href="overview.php?type=<?php echo $table; ?>&lang=tc">CHINESE</a>
```

```
                    <div class="buffer-2-5"></div>
                    <a class="btn btn-info btn-lg"
href="overview.php?type=<?php echo $table; ?>">ENGLISH</a>

                    <?php if ($table == 'next') { ?>

                    <div class="buffer-2-5"></div>
                    <a class="btn btn-warning btn-lg"
href="exhibition.php"><i class="fa fa-pencil"></i> EDIT</a>
                    <?php } ?>

                    <div class="buffer-2-5"></div>
                </div>

                <div class="col-sm-9">
                    <div id="cover">
                        <div id="title"><?php echo $lang ==
"tc" ? $titleTC : $title; ?></div>
                    </div>

                    <?php
                        if ($lang == "tc") {
                            if (strlen($descriptionTC) > 0) {
                                echo '<blockquote
id="description">';

                                echo nl2br($descriptionTC);
                                echo '</blockquote>';
                            }

                            else {
                                echo '<div class="buffer-
5"></div>';
                            }
                        }

                        else {
                            if (strlen($description) > 0) {
                                echo '<blockquote
id="description">';

                                echo nl2br($description);
                                echo '</blockquote>';
                            }

                            else {
                                echo '<div class="buffer-
5"></div>';
                            }
                        }
                    ?>

                </div>
            </div>
    </div>

    <div class="buffer-5"></div>
```

```
        <script>
        $(document).ready(function() {

                $(".animsition").animsition({

                        inClass                 :     "fade-in-up-lg",
                        outClass                :     "fade-out-down-lg",
                        inDuration              :      800,
                        outDuration             :      500,
                        linkElement             :     ".animsition-link",
                        // e.g. linkElement     :
"a:not([target="_blank"]):not([href^=#])"
                        loading                 :      true,
                        loadingParentElement    :     "body", //animsition
wrapper element
                        loadingClass            :     "animsition-loading",
                        unSupportCss            : [ "animation-duration",
                                                        "-webkit-
animation-duration",

                                                        "-o-animation-
duration"
                                                    ],
                        //"unSupportCss" option allows you to disable the
"animsition" in case the css property in the array is not supported
by your browser.
                        //The default setting is to disable the "animsition"
in a browser that does not support "animation-duration".

                        overlay                 :     false,

                        overlayClass            :     "animsition-overlay-
slide",

                        overlayParentElement    :     "body"
                });

                $('<img/>')[0].src = <?php echo '"'.$image.'"'; ?>;

        });

        </script>

</body>
</html>
```

preview.php

```
<?php
    // check login status
    session_start();
    if (!isset($_SESSION['id'])) {
        // redirect to login.php
        $host = $_SERVER['HTTP_HOST'];
        $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
        header("Location: http://$host$uri/login.php");
    }
```

```php
    // check request headers
    if (isset($_REQUEST['lang'])) {
        $lang = $_REQUEST['lang'];
    } else {
        $lang = "";
    }

    if (isset($_REQUEST['type'])) {
        $table = $_REQUEST['type'];
    } else {
        $table = "";
    }

    if (!isset($_REQUEST['id'])) {
        // redirect to last page
        $host = $_SERVER['HTTP_HOST'];
        $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
        header("Location: http://$host$uri/dump" . $table == "" ?
".php" : "_" . $table . ".php");
    }

    $con = new mysqli("","","","");
    if (mysqli_connect_errno()) {
        echo "Failed to connect to MySQL: " .
mysqli_connect_error();
    }
    mysqli_query($con, "SET NAMES utf8");

    // choose table to access
    if ($table == "prev") {
        if ($lang == "tc") {
            $stmt = $con->prepare("SELECT uuid, major, minor,
angle1, angle2, locationX, locationY, titleTC, descriptionTC,
photos, audioTC, videoTC, youtubeTC FROM lyu1403_cms_item_prev WHERE
id = ? AND user = ?");
        } else {
            $stmt = $con->prepare("SELECT uuid, major, minor,
angle1, angle2, locationX, locationY, title, description, photos,
audio, video, youtube FROM lyu1403_cms_item_prev WHERE id = ? AND
user = ?");
        }
    } elseif ($table == "next") {
        if ($lang == "tc") {
            $stmt = $con->prepare("SELECT uuid, major, minor,
angle1, angle2, locationX, locationY, titleTC, descriptionTC,
photos, audioTC, videoTC, youtubeTC FROM lyu1403_cms_item_next WHERE
id = ? AND user = ?");
        } else {
            $stmt = $con->prepare("SELECT uuid, major, minor,
angle1, angle2, locationX, locationY, title, description, photos,
audio, video, youtube FROM lyu1403_cms_item_next WHERE id = ? AND
user = ?");
        }
    } else {
        if ($lang == "tc") {
```

```php
                $stmt = $con->prepare("SELECT uuid, major, minor,
angle1, angle2, locationX, locationY, titleTC, descriptionTC,
photos, audioTC, videoTC, youtubeTC FROM lyu1403_cms_item WHERE id
= ? AND user = ?");
            } else {
                $stmt = $con->prepare("SELECT uuid, major, minor,
angle1, angle2, locationX, locationY, title, description, photos,
audio, video, youtube FROM lyu1403_cms_item WHERE id = ? AND user
= ?");
            }
        }
        $stmt->bind_param("is", $_REQUEST['id'], $_SESSION["id"]);
        $stmt->execute();
        $stmt->store_result();

        if ($stmt->num_rows == 0) {
            // redirect to last page
            $host = $_SERVER['HTTP_HOST'];
            $uri = rtrim(dirname($_SERVER['PHP_SELF']), '/\\');
            header("Location: http://$host$uri/dump" . $table == "" ?
".php" : "_" . $table . ".php");
        } else {
            $stmt->bind_result($uuid, $major, $minor, $angle1,
$angle2, $locationX, $locationY, $title, $description, $photos,
$audio, $video, $youtube);
            $stmt->fetch();
        }

        // retrieve analytics
        if ($table == "") {
            $stmt = $con->prepare("SELECT COUNT(installationID) AS
visit, AVG(rating) AS rating, COUNT(comment) AS comment FROM
lyu1403_cms_log WHERE item = ?");
            $stmt->bind_param("i", $_REQUEST['id']);
            $stmt->execute();
            $stmt->store_result();
            if ($stmt->num_rows > 0) {
                $stmt->bind_result($visit, $rating, $comment);
                $stmt->fetch();
            }

            // get comments
            $stmt = $con->prepare("SELECT comment FROM
lyu1403_cms_log WHERE item = ? AND comment IS NOT NULL");
            $stmt->bind_param("i", $_REQUEST["id"]);
            $stmt->execute();
            $stmt->store_result();
            $comments = array();
            for ($i = 0; $i < $stmt->num_rows; $i++) {
                $stmt->bind_result($c);
                $stmt->fetch();
                array_push($comments, $c);
            }
        }
?>
<!DOCTYPE html>
```

```html
<html>
<head>
      <title>PREVIEW</title>
      <meta charset="UTF-8">
      <meta name="viewport" content="width=device-width, initial-
scale=1.0, maximum-scale=1.0, user-scalable=no" />
      <script src="js/jquery-2.1.1.min.js"
type="text/javascript"></script>
      <script src="js/bootstrap.min.js"></script>
      <script src="js/isotope.pkgd.min.js"
type="text/javascript"></script>
      <script src="js/jquery.colorbox-min.js"></script>
      <script src="js/jquery.animsition.min.js"></script>
      <script src="js/jquery.transit.min.js"></script>
      <link href="css/bootstrap.min.css" rel="stylesheet"
type="text/css">
      <link href="font-awesome-4.2.0/css/font-awesome.min.css"
rel="stylesheet">
      <link href="css/colorbox.css" rel="stylesheet" type="text/css">
      <link href="css/animsition.min.css" rel="stylesheet">
      <style>
            @font-face {
                  font-family: Open Sans;
                  src: url(fonts/OpenSans-Light.ttf);
            }

            * {
                  font-family: Open Sans;
            }

            #closeButton {
                  margin-top: 75px;
                  color: #000000;
            }

            #closeButton:hover {
                  color: #000000;
            }

            #closeButton:active {
                  color: #000000;
            }

            .container-fluid {
                  margin-left: 5%;
                  margin-right: 5%;
            }

            a.item:hover {
                  text-decoration: none;
                  color: #FFFFFF;
            }

            a.item:active {
                  text-decoration: none;
                  color: #FFFFFF;
```

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```css
        }

        .buffer-2-5 {
                padding-top: 2.5%;
        }

        .buffer-5 {
                padding-top: 5%;
        }

        .operations {
                background: #CCCCCC;
        }

        .btn-group {
                margin-top: 15px;
                margin-bottom: 15px;
        }

        .main {
                color: #FFFFFF;
                background: repeating-linear-gradient(
                        45deg,
                        #000000,
                        #000000 25px,
                        #FF6600 25px,
                        #FF6600 50px
                );
        }

        .disabled {
                opacity: 0.2 !important;
        }

        #cover {
                display: block;
                position: relative;
                width: 100%;
                height: 400px;
                background:
url(http://appsrv.cse.cuhk.edu.hk/~phng2/fyp/images/pyramid.jpg)
center center no-repeat scroll;
                background-size: cover;
        }

        #title {
                display: block;
                position: absolute;
                bottom: 0px;
                color: #FFFFFF;
                font-size: 40px;
                text-shadow: 0px 0px 10px #000000;
                padding: 10px;
        }

        #description {
```

```
                    padding-top: 40px;
                    padding-bottom: 40px;
            }

            #multimediaTitle, #ratingTitle, #commentsTitle {
                    font-size: 30px;
                    text-align: right;
            }

            #rating {
                    font-size: 30px;
            }

            #comments {
                    font-size: 25px;
            }

            video {
                    width: 100%;
                    height: auto;
            }

    </style>
</head>

<body>
    <div class="container-fluid vertical-center animsition">
        <div class="row">
            <div class="col-md-12">
                <a href="dump<?php echo $table == "" ?
".php" : "_" . $table . ".php"; ?>" class="animsition-link">
                        <i class="fa fa-sort-desc fa-5x"
id="closeButton"></i>
                </a>

                <h1>PREVIEW</h1>

                <div class="buffer"></div>
            </div>
        </div>

        <div class="row">
            <div class="col-sm-3">
                <h2>DETAILS</h2>
                <div class="buffer-2-5"></div>
                UUID: <?php echo $uuid; ?><br>
                MAJOR: <?php echo $major; ?><br>
                MINOR: <?php echo $minor; ?><br>
                COMPASS ANGLE: <?php echo $angle1; ?> to <?php
echo $angle2; ?><br>

                <?php if ($table == "") { ?>
                <h2>STATISTICS</h2>
                <div class="buffer-2-5"></div>
                VISITOR COUNT: <?php echo isset($visit) ?
$visit : "0"; ?><br>
```

```
                         AVERAGE RATING: <?php echo (isset($rating) ?
round($rating, 2): "-") . " / 5" ; ?><br>
                         COMMENT COUNT: <?php echo isset($comment) ?
$comment: "0"; ?><br>
                         <?php } ?>

                         <h2>OPERATIONS</h2>

                         <div class="buffer-2-5"></div>
                         <a class="btn btn-info btn-lg"
href="preview.php?type=<?php echo $table; ?>&id=<?php echo
$_REQUEST['id']; ?>&lang=tc">CHINESE</a>

                         <div class="buffer-2-5"></div>
                         <a class="btn btn-info btn-lg"
href="preview.php?type=<?php echo $table; ?>&id=<?php echo
$_REQUEST['id']; ?>">ENGLISH</a>

                         <?php if ($table == 'next') { ?>

                         <div class="buffer-2-5"></div>
                         <a class="btn btn-warning btn-lg"
href="modify.php?id=<?php echo $_REQUEST['id']; ?>"><i class="fa fa-
pencil"></i> EDIT</a>

                         <div class="buffer-2-5"></div>
                         <div class="dropdown">
                             <button class="btn btn-danger btn-lg
dropdown-toggle" data-toggle="dropdown" id="deleteBeacon"
type="button">
                                 <i class="fa fa-trash-o"></i>
DELETE<span class="caret"></span>
                             </button>

                             <ul class="dropdown-menu">
                                 <li class="dropdown-header">DELETE
ITEM</li>
                                 <li>
                                     <a href="delete.php?id=<?php
echo $_REQUEST['id']; ?>" tabindex="-1">CONFIRM</a>
                                 </li>
                             </ul>
                         </div>
                         <?php } ?>

                         <div class="buffer-2-5"></div>
                     </div>

                 <div class="col-sm-9">
                     <div id="cover">
                         <div id="title"><?php echo
$title; ?></div>
                     </div>

                     <?php
                         if (strlen($description) > 0) {
```

```php
                                        echo '<blockquote
id="description">';
                                        echo nl2br($description);
                                        echo '</blockquote>';
                                }

                                else {
                                        echo '<div class="buffer-
5"></div>';
                                }
                        ?>

                        <?php if (strlen($audio) + strlen($video) +
strlen($youtube) > 0) { ?>
                        <div class="row">
                                <div class="col-sm-12">
                                        <div id="multimedia">
                                                <?php if (strlen($audio) > 0)
{   ?>
                                                <audio src="<?php echo
$audio; ?>" controls></audio><br />
                                                <?php } ?>
                                                <?php if (strlen($video) > 0)
{   ?>
                                                <video src="<?php echo
$video; ?>" controls></video><br />
                                                <?php } ?>
                                                <?php if (strlen($youtube) >
0) {   ?>
                                                <div  class="embed-responsive
embed-responsive-16by9">
                                                        <iframe class="embed-
responsive-item" src="http://www.youtube.com/embed/<?php echo
$youtube; ?>"></iframe>
                                                </div>
                                                <?php } ?>
                                        </div>
                                </div>
                        </div>
                        <?php } ?>

                        <div class="buffer-2-5"></div>

                        <div class="row">
                                <div class="col-sm-3" id="ratingTitle">
                                        RATING
                                </div>
                                <div class="col-sm-9">
                                        <div id="rating"><?php echo
$rating != null ? round($rating, 2) : '-'; ?> / 5</div>
                                </div>
                        </div>

                        <div class="buffer-2-5"></div>

                        <?php if (count($comments) > 0) { ?>
```

```
                        <div class="row">
                                <div class="col-sm-3" id="commentsTitle">
                                        COMMENTS
                                </div>
                                <div class="col-sm-9">
                                        <div id="comments">
                                                <?php echo implode("<br>",
$comments); ?>
                                        </div>
                                </div>
                        </div>
                        <?php } ?>

                </div>
        </div>
    </div>

    <div class="buffer-5"></div>

    <script>
    $(document).ready(function() {

        $(".animsition").animsition({

            inClass               :    "fade-in-up-lg",
            outClass              :    "fade-out-down-lg",
            inDuration            :     800,
            outDuration           :     500,
            linkElement           :    ".animsition-link",
            // e.g. linkElement   :
"a:not([target="_blank"]):not([href^=#])"
            loading               :     true,
            loadingParentElement  :    "body", //animsition
wrapper element
            loadingClass          :    "animsition-loading",
            unSupportCss          : [ "animation-duration",
                                              "-webkit-
animation-duration",

                                              "-o-animation-
duration"
                                            ],
            //"unSupportCss" option allows you to disable the
"animsition" in case the css property in the array is not supported
by your browser.
            //The default setting is to disable the "animsition"
in a browser that does not support "animation-duration".

            overlay               :     false,

            overlayClass          :    "animsition-overlay-
slide",
            overlayParentElement  :    "body"
        });

        var photos = <?php echo $photos; ?>;
        var idx;
```

250

```
                if (photos.length > 0) {
                        idx = 0;
                        $("#cover").fadeTo("fast", "0.75", function() {
                                $("#cover").css({"background": "url(" +
photos[idx] + ") center center no-repeat scroll", "background-size":
"cover"});
                                $("#cover").fadeTo("fast", "1");
                        });

                        setInterval(function () {
                                idx = (idx + 1) % photos.length;
                                $("#cover").fadeTo("fast", "0.75", function()
{
                                        $("#cover").css({"background": "url(" +
photos[idx] + ") center center no-repeat scroll", "background-size":
"cover"});
                                        $("#cover").fadeTo("fast", "1");
                                });

                        }, 5000);
                }

                // preload all photos
                $.fn.preload = function() {
                        this.each(function() {
                                $('<img/>')[0].src = this;
                        });
                }

                $(photos).preload();

        });

        </script>

</body>
</html>
```

15.1.2   Android

AboutActivity.java

```java
package hk.edu.cuhk.cse.radar2;

import android.app.Activity;
import android.os.Bundle;

/**
 * Created by Benny on 3/25/2015.
 */
public class AboutActivity extends Activity {
    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_about);
    }
}
```

DetailsFragment.java

```java
package hk.edu.cuhk.cse.radar2;

import android.app.Fragment;
import android.os.Bundle;
import android.view.LayoutInflater;
import android.view.View;
import android.view.ViewGroup;

/**
 * Created by Benny on 3/25/2015.
 */
public class DetailsFragment extends Fragment {

    public DetailsFragment(){}

    @Override
    public View onCreateView(LayoutInflater inflater, ViewGroup
container, Bundle savedInstanceState) {
        View rootView = inflater.inflate(R.layout.fragment_details,
container, false);

        return rootView;
    }
}
```

FloorPlanActivity.java

```java
package hk.edu.cuhk.cse.radar2;

import android.app.Activity;
import android.os.Bundle;
```

```java
import android.webkit.WebChromeClient;
import android.webkit.WebView;
import android.webkit.WebViewClient;

/**
 * Created by Benny on 3/25/2015.
 */
public class FloorPlanActivity extends Activity {
    WebView webViewFloorPlan;

    String id;
    int locationX, locationY;

    // URL
    public static final String CMSURL =
"http://appsrv.cse.cuhk.edu.hk/~twyeung2/cms/";

    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_floor_plan);

        // get extra
        Bundle extras = getIntent().getExtras();
        id = extras.getString("id", "");
        locationX = extras.getInt("x", 0);
        locationY = extras.getInt("y", 0);
    }

    @Override
    protected void onResume() {
        super.onResume();

        // WebView and View references
        webViewFloorPlan =
(WebView)findViewById(R.id.webViewFloorPlan);
        webViewFloorPlan.setWebViewClient(new WebViewClient());
        webViewFloorPlan.getSettings().setJavaScriptEnabled(true);
        webViewFloorPlan.loadUrl(CMSURL + "mobile_floorplan.php?id="
+ id + "&x=" + locationX + "&y=" + locationY);
    }
}
```

HomeFragment.java

```java
package hk.edu.cuhk.cse.radar2;

import android.app.Fragment;
import android.os.Bundle;
import android.util.Log;
import android.view.LayoutInflater;
import android.view.View;
import android.view.ViewGroup;
import android.webkit.WebView;
import android.webkit.WebViewClient;
```

```
import android.widget.RelativeLayout;

/**
 * Created by Benny on 3/25/2015.
 */
public class HomeFragment extends Fragment {

    public HomeFragment(){}

    WebView webViewHome;
    RelativeLayout changeContent;
    Boolean changeContentVisible = true;

    @Override
    public View onCreateView(LayoutInflater inflater, ViewGroup
container, Bundle savedInstanceState) {
        View rootView = inflater.inflate(R.layout.fragment_home,
container, false);

        return rootView;
    }

    @Override
    public void onResume() {
        super.onResume();

        // only works after onCreateView

        webViewHome =
(WebView)getView().findViewById(R.id.webViewHome);
        webViewHome.setWebViewClient(new WebViewClient());
        webViewHome.getSettings().setJavaScriptEnabled(true);
        webViewHome.getSettings().setDatabaseEnabled(true);
        webViewHome.getSettings().setDomStorageEnabled(true);
        webViewHome.loadUrl("http://www.google.com");

        changeContent =
(RelativeLayout)getView().findViewById(R.id.relativeLayoutChangeCont
ent);
    }

    public void toggleContentChange() {
        if (changeContentVisible) {
            changeContent.getLayoutParams().height = 0;
        } else {
            changeContent.getLayoutParams().height =
(int)(getResources().getDisplayMetrics().density * 160 + 05f);
        }
        changeContentVisible = !changeContentVisible;
        getView().requestLayout();
    }
}
```

MainActivity.java

```
package hk.edu.cuhk.cse.radar2;

import hk.edu.cuhk.cse.radar2.adapter.NavDrawerListAdapter;
import hk.edu.cuhk.cse.radar2.model.NavDrawerItem;

import java.io.ByteArrayOutputStream;
import java.io.File;
import java.io.FileOutputStream;
import java.io.IOException;
import java.io.RandomAccessFile;
import java.util.ArrayList;
import java.util.Collection;
import java.util.Locale;
import java.util.UUID;

import android.app.ActionBar;
import android.app.Activity;
import android.app.AlertDialog;
import android.app.Fragment;
import android.app.FragmentManager;
import android.app.NotificationManager;
import android.app.PendingIntent;
import android.content.Context;
import android.content.DialogInterface;
import android.content.Intent;
import android.content.SharedPreferences;
import android.content.res.Configuration;
import android.content.res.Resources;
import android.content.res.TypedArray;
import android.graphics.BitmapFactory;
import android.hardware.Sensor;
import android.hardware.SensorEvent;
import android.hardware.SensorEventListener;
import android.hardware.SensorManager;
import android.net.Uri;
import android.os.AsyncTask;
import android.os.Bundle;
import android.os.Handler;
import android.os.RemoteException;
import android.os.Vibrator;
import android.preference.PreferenceManager;
import android.support.v4.app.ActionBarDrawerToggle;
import android.support.v4.app.NotificationCompat;
import android.support.v4.widget.DrawerLayout;
import android.util.Log;
import android.view.Menu;
import android.view.MenuItem;
import android.view.View;
import android.view.Window;
import android.view.WindowManager;
import android.webkit.WebChromeClient;
import android.webkit.WebView;
import android.webkit.WebViewClient;
import android.widget.AdapterView;
import android.widget.Button;
import android.widget.ListView;
```

```java
import android.widget.RelativeLayout;
import android.widget.Toast;

import com.firebase.client.DataSnapshot;
import com.firebase.client.Firebase;
import com.firebase.client.FirebaseError;
import com.firebase.client.ValueEventListener;

import org.altbeacon.beacon.Beacon;
import org.altbeacon.beacon.BeaconConsumer;
import org.altbeacon.beacon.BeaconManager;
import org.altbeacon.beacon.BeaconParser;
import org.altbeacon.beacon.RangeNotifier;
import org.altbeacon.beacon.Region;
import org.altbeacon.beacon.powersave.BackgroundPowerSaver;
import org.apache.http.HttpResponse;
import org.apache.http.HttpStatus;
import org.apache.http.StatusLine;
import org.apache.http.client.HttpClient;
import org.apache.http.client.methods.HttpGet;
import org.apache.http.impl.client.DefaultHttpClient;
import org.json.JSONArray;
import org.json.JSONException;
import org.json.JSONObject;

public class MainActivity extends Activity implements
BeaconConsumer, SensorEventListener {
    private DrawerLayout mDrawerLayout;
    private ListView mDrawerList;
    private ActionBarDrawerToggle mDrawerToggle;

    // UI states and references
    Boolean changeContentVisible = true;
    RelativeLayout changeContent;
    WebView webViewHome;
    Button changeContent1, changeContent2;

    int state = 0;  // 0: detecting exhibition; 1: requesting list
from server; 2: ready to browse

    // beacon and sensor values
    BeaconManager beaconManager;
    SensorManager sensorManager;

    String currentUuid = "";
    int currentMajor, currentMinor, currentAzimuth = 0;

    // exhibition data
    String exhibitionID, exhibitionTitle, exhibitionTitleTC;
    ArrayList<Item> itemList = new ArrayList<Item>();

    Item currentItem = null;
    Item[] validItem = {null, null};
    int[] validExpiry = {0, 0};

    // nav drawer title
```

```java
    private CharSequence mDrawerTitle;

    // used to store app title
    private CharSequence mTitle;

    // slide menu items
    private String[] navMenuTitles;
    private TypedArray navMenuIcons;

    private ArrayList<NavDrawerItem> navDrawerItems;
    private NavDrawerListAdapter adapter;

    ActionBar mActionBar;

    // user ID
    private static String userID;
    private static final String IDFILENAME = "radar2";

    // preferences
    private String lang;
    private Boolean autostart;

    // URL
    public static final String CMSURL =
"http://appsrv.cse.cuhk.edu.hk/~twyeung2/cms/";

    // Firebase
    private Firebase firebaseRef;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        Firebase.setAndroidContext(this);

        getWindow().requestFeature(Window.FEATURE_ACTION_BAR);
        setContentView(R.layout.activity_main);
        mTitle = mDrawerTitle = getTitle();

        // switch language; restart in new locale
        lang =
PreferenceManager.getDefaultSharedPreferences(this).getString("pref_
language", "en");
        Locale locale, current;
        if (lang.equals("tc")) {
            locale = Locale.CHINESE;
        } else {
            locale = Locale.ENGLISH;
        }

        current = getResources().getConfiguration().locale;
        if (!current.equals(locale)) {
            Locale.setDefault(locale);
            Configuration config = new Configuration();
            config.locale = locale;
            Resources resources = getResources();
            resources.updateConfiguration(config,
```

```java
resources.getDisplayMetrics());
            recreate();
        }

        // check Bluetooth availability
        try {
            if
(!BeaconManager.getInstanceForApplication(this).checkAvailability())
{
                final AlertDialog.Builder builder = new
AlertDialog.Builder(this);

builder.setTitle(getResources().getString(R.string.title_bt_disabled
));

builder.setMessage(getResources().getString(R.string.msg_bt_disabled
));
                builder.setPositiveButton(android.R.string.ok,
null);
                AlertDialog ad = builder.create();

ad.getWindow().clearFlags(WindowManager.LayoutParams.FLAG_DIM_BEHIND
);
                ad.show();
            }
        }
        catch (RuntimeException e) {
            final AlertDialog.Builder builder = new
AlertDialog.Builder(this);

builder.setTitle(getResources().getString(R.string.title_ble_na));

builder.setMessage(getResources().getString(R.string.msg_ble_na));
            builder.setPositiveButton(android.R.string.ok, null);
            builder.setOnDismissListener(new
DialogInterface.OnDismissListener() {
                @Override
                public void onDismiss(DialogInterface dialog) {
                    finish();
                    System.exit(0);
                }
            });
            builder.show();
        }

        // initialize beacon scanning
        beaconManager =
BeaconManager.getInstanceForApplication(this);
        beaconManager.getBeaconParsers().add(new
BeaconParser().setBeaconLayout("m:2-3=0215,i:4-19,i:20-21,i:22-
23,p:24-24"));
        beaconManager.setBackgroundBetweenScanPeriod(0l);
        beaconManager.setBackgroundScanPeriod(1000l);
        beaconManager.setForegroundBetweenScanPeriod(0l);
        beaconManager.setForegroundScanPeriod(1000l);
        beaconManager.bind(this);
```

```
        // initialize sensor
        sensorManager = (SensorManager)
getSystemService(Context.SENSOR_SERVICE);

        // get/set user id
        if (userID == null) {
            File IDFile = new File(this.getFilesDir(), IDFILENAME);
            try {
                // file containing ID does not exist: generate a new
                if (!IDFile.exists()) {
                    FileOutputStream out = new
FileOutputStream(IDFile);
                    userID = UUID.randomUUID().toString().replace("-
", "").toUpperCase();
                    out.write(userID.getBytes());
                    out.close();
                }

                // file exists: read ID from file
                else {
                    RandomAccessFile f = new
RandomAccessFile(IDFile, "r");
                    byte[] bytes = new byte[(int) f.length()];
                    f.readFully(bytes);
                    f.close();
                    userID = new String(bytes);
                }
            } catch (IOException e) {
                Toast.makeText(this, "Error getting user ID",
Toast.LENGTH_SHORT).show();
            }
        }

        // load slide menu items
        navMenuTitles =
getResources().getStringArray(R.array.nav_drawer_items);

        // nav drawer icons from resources
        navMenuIcons =
getResources().obtainTypedArray(R.array.nav_drawer_icons);

        mDrawerLayout = (DrawerLayout)
findViewById(R.id.drawer_layout);
        mDrawerList = (ListView) findViewById(R.id.list_slidermenu);

        navDrawerItems = new ArrayList<NavDrawerItem>();

        // adding nav drawer items to array
        navDrawerItems.add(new NavDrawerItem(navMenuTitles[0],
navMenuIcons.getResourceId(0, -1)));
        navDrawerItems.add(new NavDrawerItem(navMenuTitles[1],
navMenuIcons.getResourceId(1, -1)));
        navDrawerItems.add(new NavDrawerItem(navMenuTitles[2],
navMenuIcons.getResourceId(2, -1)));
        navDrawerItems.add(new NavDrawerItem(navMenuTitles[3],
```

```
navMenuIcons.getResourceId(3, -1)));

        // Recycle the typed array
        navMenuIcons.recycle();

        mDrawerList.setOnItemClickListener(new
SlideMenuClickListener());

        // setting the nav drawer list adapter
        adapter = new NavDrawerListAdapter(getApplicationContext(),
navDrawerItems);
        mDrawerList.setAdapter(adapter);

        // enabling action bar app icon and behaving it as toggle
button
        mActionBar = getActionBar();

        mActionBar.setDisplayHomeAsUpEnabled(true);
        mActionBar.setHomeButtonEnabled(true);

        mDrawerToggle = new ActionBarDrawerToggle(this,
mDrawerLayout,
                R.drawable.ic_drawer, //nav menu toggle icon
                R.string.drawer_open, // nav drawer open -
description for accessibility
                R.string.drawer_close // nav drawer close -
description for accessibility
        ) {
            public void onDrawerClosed(View view) {
                mActionBar.setTitle(mTitle);
                // calling onPrepareOptionsMenu() to show action bar
icons
                invalidateOptionsMenu();
            }

            public void onDrawerOpened(View drawerView) {
                mActionBar.setTitle(mDrawerTitle);
                // calling onPrepareOptionsMenu() to hide action bar
icons
                invalidateOptionsMenu();
            }
        };
        mDrawerLayout.setDrawerListener(mDrawerToggle);

        // WebView and View references
        webViewHome = (WebView)findViewById(R.id.webViewHome);
        webViewHome.setWebViewClient(new WebViewClient());
        webViewHome.setWebChromeClient(new WebChromeClient());
        webViewHome.getSettings().setJavaScriptEnabled(true);
        webViewHome.getSettings().setDatabaseEnabled(true);
        webViewHome.getSettings().setDomStorageEnabled(true);

webViewHome.getSettings().setMediaPlaybackRequiresUserGesture(false)
;
        webViewHome.loadUrl(CMSURL + "loading.php?lang=" + lang);
```

```
        changeContent =
(RelativeLayout)findViewById(R.id.relativeLayoutChangeContent);
        changeContent1 =
(Button)findViewById(R.id.buttonChangeContent1);
        changeContent2 =
(Button)findViewById(R.id.buttonChangeContent2);

        changeContent1.setOnClickListener(new View.OnClickListener()
{
            @Override
            public void onClick(View v) {
                currentItem = validItem[0];
                validExpiry[0] = 0;
                runOnUiThread(new Runnable() {
                    @Override
                    public void run() {
                        loadItemPage();
                    }
                });
            }
        });

        changeContent2.setOnClickListener(new View.OnClickListener()
{
            @Override
            public void onClick(View v) {
                currentItem = validItem[1];
                validExpiry[1] = 0;
                runOnUiThread(new Runnable() {
                    @Override
                    public void run() {
                        loadItemPage();
                    }
                });
            }
        });
    }

    @Override
    protected void onResume() {
        super.onResume();
        lang =
PreferenceManager.getDefaultSharedPreferences(this).getString("pref_
language", "en");
        autostart =
PreferenceManager.getDefaultSharedPreferences(this).getBoolean("pref
_audio_autostart", true);

        sensorManager.registerListener(this,
sensorManager.getDefaultSensor(Sensor.TYPE_ORIENTATION),
SensorManager.SENSOR_DELAY_NORMAL);
    }

    protected void loadExhibitionPage() {
        webViewHome.loadUrl(CMSURL + "mobile_overview.php?id=" +
Uri.encode(exhibitionID) + "&lang=" + lang);
```

```java
            if (lang.equals("tc")) {
                setTitle(exhibitionTitleTC);
            } else {
                setTitle(exhibitionTitle);
            }
        mDrawerList.setItemChecked(0, true);
        mDrawerList.setSelection(0);
    }

    protected void loadItemPage() {
        if (currentItem != null) {
            webViewHome.loadUrl(CMSURL + "mobile_preview.php?id=" +
Integer.toString(currentItem.id) + "&lang=" + lang + "&user=" +
userID + (autostart ? "&autostart" : ""));
            setTitle(lang.equals("tc") ? currentItem.titleTC :
currentItem.title);
            mDrawerList.setItemChecked(1, true);
            mDrawerList.setSelection(1);
        }
    }

    protected void matchValidItem() {
        final int COUNTDOWN = 30;

        // decrement entry expiry timeout
        if (validExpiry[0] > 0) validExpiry[0]--;
        if (validExpiry[1] > 0) validExpiry[1]--;

        // match items one by one for UUID, major, minor and azimuth
        for (Item it : itemList) {
            if (currentUuid.equals(it.uuid) && currentMajor ==
it.major && currentMinor == it.minor) {
                if (currentItem != null && it.id == currentItem.id)
{
                    continue;
                }

                // angle1 < angle2: clockwise; no passing through
North
                // angle1 > angle2: clockwise, thus passing through
North
                if ((it.angle1 < it.angle2 && it.angle1 <
currentAzimuth && currentAzimuth < it.angle2) ||
                        (it.angle1 > it.angle2 && (currentAzimuth >
it.angle1 || currentAzimuth < it.angle2))) {
                    // the item is valid

                    // already a suggestion: keep expiry count
                    if (validItem[0] != null && validItem[0].id ==
it.id) {
                        validExpiry[0] = COUNTDOWN;
                    } else if (validItem[1] != null &&
validItem[1].id == it.id) {
                        validExpiry[1] = COUNTDOWN;
                    }
```

```java
                           // look for an available spot to fit the
suggestion in
                    else {
                        for (int i = 0; i < 2; i++) {
                            if (validExpiry[i] == 0) {
                                validItem[i] = it;
                                validExpiry[i] = COUNTDOWN;
                                break;
                            }
                        }
                    }
                }
            }
        }

        // move second item to first, just in case
        if (validExpiry[0] == 0 && validExpiry[1] != 0) {
            validExpiry[0] = validExpiry[1];
            validItem[0] = validItem[1];
            validExpiry[1] = 0;
        }

        // update UI to indicate suggestion
        if (validExpiry[0] > 0 && validExpiry[1] > 0) {
            // two suggestions
            changeContent1.setText(lang.equals("tc") ?
validItem[0].titleTC : validItem[0].title);
            changeContent2.setText(lang.equals("tc") ?
validItem[1].titleTC : validItem[1].title);
            changeContent.getLayoutParams().height =
(int)(getResources().getDisplayMetrics().density * 150 + 0.5f);
        } else if (validExpiry[0] > 0) {
            // one suggestion
            changeContent1.setText(lang.equals("tc") ?
validItem[0].titleTC : validItem[0].title);
            changeContent.getLayoutParams().height =
(int)(getResources().getDisplayMetrics().density * 100 + 0.5f);
        } else {
            // no suggestion
            changeContent.getLayoutParams().height = 0;
        }

        changeContent.requestLayout();
    }

    protected void initializeFirebase() {
        firebaseRef = new Firebase("https://torid-heat-
3228.firebaseio.com/radar2/" + exhibitionID);

        final Vibrator vibrator =
(Vibrator)getSystemService(Context.VIBRATOR_SERVICE);

        Intent resultIntent = new Intent(this, MainActivity.class);
        final PendingIntent pendingIntent =
PendingIntent.getActivity(this, 0, resultIntent,
PendingIntent.FLAG_UPDATE_CURRENT);
```

```java
        firebaseRef.addValueEventListener(new ValueEventListener() {
            Boolean first = true;

            @Override
            public void onDataChange(DataSnapshot dataSnapshot) {
                if (first) {
                    first = false;
                    return;
                }

                String message =
dataSnapshot.child("message").getValue().toString();
                String messageTC =
dataSnapshot.child("messageTC").getValue().toString();
                if (lang.equals("tc")) {
                    message = messageTC;
                }

                if (!message.equals("")) {
                    vibrator.vibrate(500);
                    NotificationCompat.Builder
notificationCompatBuilder = new
NotificationCompat.Builder(getApplicationContext())
                            .setSmallIcon(R.drawable.ic_radar)
                            .setLargeIcon(BitmapFactory.decodeResour
ce(getResources(), R.drawable.ic_radar))
                            .setContentTitle(lang.equals("tc") ?
exhibitionTitleTC : exhibitionTitle)
                            .setContentText(message)
                            .setContentIntent(pendingIntent)
                            .setAutoCancel(true);
                    NotificationManager notificationManager =
(NotificationManager)getSystemService(NOTIFICATION_SERVICE);
                    notificationManager.notify(3943,
notificationCompatBuilder.build());
                }
            }

            @Override
            public void onCancelled(FirebaseError firebaseError) {

            }
        });
    }

    @Override
    public void onBeaconServiceConnect() {
        beaconManager.setRangeNotifier(new RangeNotifier() {
            @Override
            public void didRangeBeaconsInRegion(Collection<Beacon>
beacons, Region region) {
                // find beacon with smallest distance
                String minID1 = "", minID2 = "0", minID3 = "0";
                double minDistance = Double.MAX_VALUE;
                for (Beacon b : beacons) {
```

```
                    if (b.getDistance() < minDistance) {
                        minDistance = b.getDistance();

                        minID1 = b.getId1().toString();
                        minID2 = b.getId2().toString();
                        minID3 = b.getId3().toString();
                    }
                }
                if (minDistance < Double.MAX_VALUE) {
                    currentUuid = minID1.replace("-",
"").toUpperCase();

                    currentMajor = Integer.parseInt(minID2);
                    currentMinor = Integer.parseInt(minID3);
                } else {
                    currentUuid = "";
                }

                // request for exhibition data
                if (state == 0 && beacons.size() > 0) {
                    state = 1;
                    new FetchListTask().execute(currentUuid,
Integer.toString(currentMajor), Integer.toString(currentMinor));
                }
            }
        });

        try {
            beaconManager.startRangingBeaconsInRegion(new
Region("myRangingUniqueId", null, null, null));
        } catch (RemoteException e) {
        }
    }

    @Override
    public void onAccuracyChanged(Sensor sensor, int accuracy) {

    }

    @Override
    public void onSensorChanged(SensorEvent event) {
        // update compass bearing
        currentAzimuth = (int)(event.values[0]) % 360;

        runOnUiThread(new Runnable() {
            @Override
            public void run() {
                matchValidItem();
            }
        });
    }

    // Slide menu item click listener
    private class SlideMenuClickListener implements
ListView.OnItemClickListener {
        @Override
        public void onItemClick(AdapterView<?> parent, View view,
```

```java
int position, long id) {
            // display view for selected nav drawer item
            displayView(position);
        }
    }

    @Override
    public boolean onCreateOptionsMenu(Menu menu) {
        getMenuInflater().inflate(R.menu.menu_main, menu);
        return super.onCreateOptionsMenu(menu);
    }

    @Override
    public boolean onOptionsItemSelected(MenuItem item) {
        // toggle nav drawer on selecting action bar app icon/title
        if (mDrawerToggle.onOptionsItemSelected(item)) {
            return true;
        }
        // Handle action bar actions click
        switch (item.getItemId()) {
            case R.id.action_map:
                if (state == 2) {
                    Intent intent = new Intent(this,
FloorPlanActivity.class);
                    intent.putExtra("id", exhibitionID);
                    if (currentItem != null) {
                        intent.putExtra("x", currentItem.locationX);
                        intent.putExtra("y", currentItem.locationY);
                    }
                    startActivity(intent);
                }
                return true;
            default:
                return super.onOptionsItemSelected(item);
        }
    }

    // Called when invalidateOptionsMenu() is triggered
    @Override
    public boolean onPrepareOptionsMenu(Menu menu) {
        // if nav drawer is opened, hide the action items
        boolean drawerOpen =
mDrawerLayout.isDrawerOpen(mDrawerList);
        menu.findItem(R.id.action_map).setVisible(!drawerOpen);
        return super.onPrepareOptionsMenu(menu);
    }

    // Displaying fragment view for selected nav drawer list item
    private void displayView(int position) {
        // update the main content by replacing fragments
        Intent intent;
        switch (position) {
            case 0:
                if (state == 2) {
                    loadExhibitionPage();
                }
```

```java
                        break;
                case 1:
                    if (state == 2) {
                        loadItemPage();
                    }
                    break;
                case 2:
                    intent = new Intent(this, SettingsActivity.class);
                    startActivity(intent);
                    break;
                case 3:
                    intent = new Intent(this, AboutActivity.class);
                    startActivity(intent);
                    break;
                default:
                    break;
        }

        // close the drawer
        mDrawerLayout.closeDrawer(mDrawerList);
    }

    @Override
    public void setTitle(CharSequence title) {
        mTitle = title;
        getActionBar().setTitle(mTitle);
    }

    @Override
    protected void onDestroy() {
        super.onDestroy();
        beaconManager.unbind(this);
    }

    // When using the ActionBarDrawerToggle, you must call it during
    // onPostCreate() and onConfigurationChanged()...
    @Override
    protected void onPostCreate(Bundle savedInstanceState) {
        super.onPostCreate(savedInstanceState);
        // Sync the toggle state after onRestoreInstanceState has
occurred.
        mDrawerToggle.syncState();
    }

    @Override
    public void onConfigurationChanged(Configuration newConfig) {
        super.onConfigurationChanged(newConfig);
        // Pass any configuration change to the drawer toggles
        mDrawerToggle.onConfigurationChanged(newConfig);
    }

    protected class FetchListTask extends AsyncTask<String, Void,
String> {
        @Override
        protected String doInBackground(String... params) {
            try {
```

```java
                    HttpClient loginHttpClient = new
DefaultHttpClient();
                    HttpResponse response = loginHttpClient.execute(new
HttpGet(CMSURL + "fetchList/?uuid=" + Uri.encode(params[0]) +
"&major=" + Uri.encode(params[1]) + "&minor=" +
Uri.encode(params[2])));
                    StatusLine statusLine = response.getStatusLine();

                    if (statusLine.getStatusCode() == HttpStatus.SC_OK)
{
                        ByteArrayOutputStream byteOut = new
ByteArrayOutputStream();
                        response.getEntity().writeTo(byteOut);
                        byteOut.close();

                        return byteOut.toString();
                    }
                    else {
                        response.getEntity().getContent().close();
                        throw new
IOException(statusLine.getReasonPhrase());
                    }
                }
                catch (Exception e) {
                    // Unstable network
                    runOnUiThread(new Runnable() {
                        @Override
                        public void run() {
                            Toast.makeText(getApplicationContext(),
"Network error. Retrying...", Toast.LENGTH_SHORT).show();
                        }
                    });
                    state = 0;
                    return "";
                }
            }

            @Override
            protected void onPostExecute(String s) {
                if (s.equals("")) return;

                try {
                    JSONObject res = new JSONObject(s);

                    // handle error
                    if (res.getString("id").equals("-2")) {
                        runOnUiThread(new Runnable() {
                            @Override
                            public void run() {
                                Toast.makeText(getApplicationContext(),
"Database error. Retrying...", Toast.LENGTH_SHORT).show();
                            }
                        });
                        state = 0;
                    }
                    else if (res.getString("id").equals("-1")) {
```

```
                    state = 0;
                }

                // valid beacon to exhibition mapping found; parse
the JSON response
                else {
                    exhibitionID = res.getString("id");
                    exhibitionTitle = res.getString("title");
                    exhibitionTitleTC = res.getString("titleTC");
                    JSONArray arr = res.getJSONArray("items");

                    for (int i = 0; i < arr.length(); i++) {
                        Item it = new Item();
                        JSONObject obj = arr.getJSONObject(i);

                        it.id = obj.getInt("id");
                        it.uuid = obj.getString("uuid");
                        it.major = obj.getInt("major");
                        it.minor = obj.getInt("minor");
                        it.angle1 = obj.getInt("angle1");
                        it.angle2 = obj.getInt("angle2");
                        it.locationX = obj.getInt("locationX");
                        it.locationY = obj.getInt("locationY");
                        it.title = obj.getString("title");
                        it.titleTC = obj.getString("titleTC");

                        itemList.add(it);
                    }

                    runOnUiThread(new Runnable() {
                        @Override
                        public void run() {
                            loadExhibitionPage();
                            initializeFirebase();
                        }
                    });

                    state = 2;
                }
            } catch (JSONException e) {
                runOnUiThread(new Runnable() {
                    @Override
                    public void run() {
                        Toast.makeText(getApplicationContext(),
"Database error. Retrying...", Toast.LENGTH_SHORT).show();
                    }
                });
                state = 0;
            }
        }
    }

    protected class Item {
        public String uuid, title, titleTC;
        public int id, major, minor, angle1, angle2, locationX,
locationY;
```

```
        }
}
```

SettingsActivity.java

```java
package hk.edu.cuhk.cse.radar2;

import android.content.SharedPreferences;
import android.content.res.Configuration;
import android.content.res.Resources;
import android.os.Bundle;
import android.preference.PreferenceActivity;
import android.preference.PreferenceManager;
import android.widget.Toast;

import java.util.Locale;

public class SettingsActivity extends PreferenceActivity {
    String lang;

    SharedPreferences.OnSharedPreferenceChangeListener spChanged =
new SharedPreferences.OnSharedPreferenceChangeListener() {
        @Override
        public void onSharedPreferenceChanged(SharedPreferences sp,
String key) {
            String newLang = sp.getString("pref_language", "en");
            if (!lang.equals(newLang) && newLang.equals("tc")) {
                Toast.makeText(SettingsActivity.this, "語言設定將會在下
次程式啟動時生效", Toast.LENGTH_LONG).show();
            } else if (!lang.equals(newLang) &&
newLang.equals("en")) {
                Toast.makeText(SettingsActivity.this, "Language
settings will take effect upon next app launch",
Toast.LENGTH_LONG).show();
            }
        }
    };

    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        addPreferencesFromResource(R.xml.pref_radar);

        SharedPreferences preferences =
PreferenceManager.getDefaultSharedPreferences(this);
        lang = preferences.getString("pref_language", "en");

preferences.registerOnSharedPreferenceChangeListener(spChanged);
    }
}
```

NavDrawerItem.java

```java
package hk.edu.cuhk.cse.radar2.model;
```

```java
/**
 * Created by Benny on 3/25/2015.
 */
public class NavDrawerItem {

    private String title;
    private int icon;
    private String count = "0";
    private boolean isCounterVisible = false;

    public NavDrawerItem(){}

    public NavDrawerItem(String title, int icon) {
        this.title = title;
        this.icon = icon;
    }

    public NavDrawerItem(String title, int icon, boolean
isCounterVisible, String count) {
        this.title = title;
        this.icon = icon;
        this.isCounterVisible = isCounterVisible;
        this.count = count;
    }

    public String getTitle() {
        return this.title;
    }

    public int getIcon() {
        return this.icon;
    }

    public String getCount() {
        return this.count;
    }

    public boolean getCounterVisibility() {
        return this.isCounterVisible;
    }

    public void setTitle(String title) {
        this.title = title;
    }

    public void setIcon(int icon) {
        this.icon = icon;
    }

    public void setCount(String count) {
        this.count = count;
    }

    public void setCounterVisibility(boolean isCounterVisible) {
        this.isCounterVisible = isCounterVisible;
    }
```

```
}
```

NavDrawerListAdapter.java

```java
package hk.edu.cuhk.cse.radar2.adapter;

import android.app.Activity;
import android.content.Context;
import android.view.LayoutInflater;
import android.view.View;
import android.view.ViewGroup;
import android.widget.BaseAdapter;
import android.widget.ImageView;
import android.widget.TextView;


import java.util.ArrayList;

import hk.edu.cuhk.cse.radar2.R;
import hk.edu.cuhk.cse.radar2.model.NavDrawerItem;

/**
 * Created by Benny on 3/25/2015.
 */
public class NavDrawerListAdapter extends BaseAdapter {

    private Context context;
    private ArrayList<NavDrawerItem> navDrawerItems;

    public NavDrawerListAdapter(Context context,
ArrayList<NavDrawerItem> navDrawerItems) {
        this.context = context;
        this.navDrawerItems = navDrawerItems;
    }

    @Override
    public int getCount() {
        return navDrawerItems.size();
    }

    @Override
    public Object getItem(int position) {
        return navDrawerItems.get(position);
    }

    @Override
    public long getItemId(int position) {
        return position;
    }

    @Override
    public View getView(int position, View convertView, ViewGroup
parent) {
        if (convertView == null) {
            LayoutInflater mInflater =
(LayoutInflater)context.getSystemService(Activity.LAYOUT_INFLATER_SE
```

```
RVICE);

            convertView =
mInflater.inflate(R.layout.drawer_list_item, null);

        }

        ImageView imgIcon =
(ImageView)convertView.findViewById(R.id.icon);
        TextView txtTitle =
(TextView)convertView.findViewById(R.id.title);
        TextView txtCount =
(TextView)convertView.findViewById(R.id.counter);


imgIcon.setImageResource(navDrawerItems.get(position).getIcon());
        txtTitle.setText(navDrawerItems.get(position).getTitle());

        if (navDrawerItems.get(position).getCounterVisibility()) {

txtCount.setText(navDrawerItems.get(position).getTitle());
        }
        else {
            txtCount.setVisibility(View.GONE);
        }

        return convertView;
    }
}
```

activity_about.xml

```xml
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="match_parent" >

    <ScrollView
        android:layout_width="match_parent"
        android:layout_height="match_parent"
        android:id="@+id/scrollView"
        android:layout_alignParentTop="true"
        android:layout_centerHorizontal="true">

        <RelativeLayout
            android:layout_width="match_parent"
            android:layout_height="match_parent">

            <TextView
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                android:text="Radar 2"
                android:id="@+id/textViewAboutTitle"
                android:textSize="50dp"
```

```
                android:layout_alignParentTop="true"
                android:layout_centerHorizontal="true"
                android:layout_marginTop="100dp" />

            <TextView
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                android:text="NG Ping Him\nYEUNG Tak Wing"
                android:id="@+id/textViewAboutAuthors"
                android:textSize="30dp"
                android:gravity="center"
                android:layout_below="@+id/textViewAboutTitle"
                android:layout_centerHorizontal="true"
                android:layout_marginTop="50dp" />

            <TextView
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                android:text="CSE, CUHK\n2015"
                android:id="@+id/textViewAboutDepartment"
                android:textSize="20dp"
                android:gravity="center"
                android:layout_below="@+id/textViewAboutAuthors"
                android:layout_centerHorizontal="true"
                android:layout_marginTop="10dp" />

            <TextView
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                android:text="0.0.0.1"
                android:id="@+id/textViewAboutVersion"
                android:textSize="15dp"
                android:gravity="center"
                android:layout_below="@+id/textViewAboutDepartment"
                android:layout_centerHorizontal="true"
                android:layout_margin="10dp"/>
        </RelativeLayout>
    </ScrollView>

</RelativeLayout>
```

activity_floor_plan.xml

```
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="match_parent" >

    <WebView
        android:layout_width="match_parent"
        android:layout_height="match_parent"
        android:id="@+id/webViewFloorPlan"
        android:layout_alignParentTop="true"
        android:layout_centerHorizontal="true" />
```

```
</RelativeLayout>
```

activity_mail.xml

```xml
<android.support.v4.widget.DrawerLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    android:id="@+id/drawer_layout"
    android:layout_width="match_parent"
    android:layout_height="match_parent" >

    <RelativeLayout
xmlns:android="http://schemas.android.com/apk/res/android"
        android:layout_width="match_parent"
        android:layout_height="match_parent" >

        <WebView
            android:layout_width="match_parent"
            android:layout_height="match_parent"
            android:id="@+id/webViewHome"
            android:layout_above="@+id/relativeLayoutChangeContent"
            android:layout_alignParentStart="true" />

        <RelativeLayout
            android:id="@+id/relativeLayoutChangeContent"
            android:layout_width="fill_parent"
            android:layout_height="0dp"
            android:background="#DDDDDD"
            android:layout_alignParentBottom="true"
            android:layout_centerHorizontal="true">

            <TextView
                android:id="@+id/textViewChangeContentTitle"
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                android:layout_margin="10dp"
                android:textSize="25dp"
                android:textColor="#000000"
                android:text="@string/title_change_content"
                android:layout_alignParentTop="true"
                android:layout_alignParentLeft="true"
                android:layout_alignParentStart="true" />

            <Button
                android:id="@+id/buttonChangeContent1"
                android:layout_width="match_parent"
                android:layout_height="wrap_content"
                android:text="Item 1"
                android:singleLine="true"
                android:ellipsize="marquee"
                android:layout_centerHorizontal="true"
                android:layout_marginLeft="10dp"
                android:layout_marginRight="10dp"

android:layout_below="@+id/textViewChangeContentTitle" />
```

```
                <Button
                    android:id="@+id/buttonChangeContent2"
                    android:layout_width="match_parent"
                    android:layout_height="wrap_content"
                    android:text="Item 2"
                    android:singleLine="true"
                    android:ellipsize="marquee"
                    android:layout_centerHorizontal="true"
                    android:layout_marginLeft="10dp"
                    android:layout_marginRight="10dp"
                    android:layout_below="@+id/buttonChangeContent1" />
        </RelativeLayout>
    </RelativeLayout>

    <ListView
        android:id="@+id/list_slidermenu"
        android:layout_width="240dp"
        android:layout_height="match_parent"
        android:layout_gravity="start"
        android:choiceMode="singleChoice"
        android:divider="@color/list_divider"
        android:dividerHeight="1dp"
        android:listSelector="@drawable/list_selector"
        android:background="@color/list_background"/>

</android.support.v4.widget.DrawerLayout>
```

drawer_list_item.xml

```
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="48dp"
    android:background="@drawable/list_selector" >

    <ImageView
        android:id="@+id/icon"
        android:layout_width="25dp"
        android:layout_height="wrap_content"
        android:layout_alignParentLeft="true"
        android:layout_marginLeft="12dp"
        android:layout_marginRight="12dp"
        android:contentDescription="@string/desc_list_item_icon"
        android:src="@mipmap/ic_launcher"
        android:layout_centerVertical="true" />

    <TextView
        android:id="@+id/title"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_toRightOf="@id/icon"

android:minHeight="?android:attr/listPreferredItemHeightSmall"
```

```
android:textAppearance="?android:attr/textAppearanceListItemSmall"
        android:textColor="@color/list_item_title"
        android:textSize="15dp"
        android:gravity="center_vertical"
        android:paddingRight="40dp" />

    <TextView
        android:id="@+id/counter"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:background="@drawable/counter_bg"
        android:layout_alignParentRight="true"
        android:layout_marginRight="8dp"
        android:textColor="@color/counter_text_color" />

</RelativeLayout>
```

fragment_details.xml

```
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="match_parent" >

    <ScrollView
        android:id="@+id/scrollViewDetails"
        android:layout_width="match_parent"
        android:layout_height="match_parent"
        android:layout_alignParentTop="true"
        android:layout_centerHorizontal="true" >

        <RelativeLayout
xmlns:android="http://schemas.android.com/apk/res/android"
            android:layout_width="match_parent"
            android:layout_height="match_parent" >

            <ImageView
                android:id="@+id/imageViewCover"
                android:layout_width="match_parent"
                android:layout_height="150dp"
                android:scaleType="centerCrop"
                android:src="@drawable/cover"
                android:layout_alignParentTop="true"
                android:layout_centerHorizontal="true" />

            <TextView
                android:id="@+id/textViewDetailsTitle"
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                android:text="Mesoamerican Pyramids"
                android:textSize="25dp"
                android:layout_below="@+id/imageViewCover"
                android:layout_margin="15dp" />
```

```
        <TextView
            android:id="@+id/textViewDetailsDescription"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:text="Lorem ipsum dolor sit amet,
consectetur adipiscing elit. Nunc placerat orci elit, vel
condimentum mauris ornare ut. Nam sodales feugiat imperdiet. Nunc
quis commodo leo, ut egestas nisl. Nunc ut rhoncus turpis. Nullam
viverra libero a lorem dignissim pellentesque. Sed lobortis mi
tincidunt ipsum ullamcorper, in venenatis orci lacinia. Ut tempus
sed odio non aliquam. Proin eget leo sed mauris tincidunt pulvinar
eget et tellus. Etiam porttitor felis felis, et tincidunt risus
elementum eget. Duis pulvinar, tortor ac porta semper, ex nisi
tempus mauris, non tempus diam ligula a massa. Curabitur eu felis
velit. Praesent porta aliquet mollis. Phasellus laoreet metus
sapien, nec molestie tellus scelerisque non. Nulla hendrerit arcu id
nisl malesuada fringilla.

Integer blandit, odio quis interdum dapibus, leo augue consectetur
tortor, eu sagittis leo lorem quis mi. Nam luctus nibh urna, sit
amet mollis augue rutrum non. Donec vitae scelerisque erat, ac
maximus velit. Donec fringilla purus felis, ut vehicula orci
hendrerit ut. Morbi sed volutpat sapien, quis imperdiet elit. Donec
at lorem viverra, semper leo eget, tristique quam. Etiam viverra
neque sed tincidunt varius. Nulla quis semper quam. Phasellus vitae
sollicitudin urna. Praesent sit amet hendrerit eros, ut blandit
magna. Duis venenatis facilisis ex, sit amet pellentesque ante
suscipit non.

Donec accumsan turpis rutrum velit porttitor interdum. Pellentesque
venenatis fringilla nisl, a consequat justo aliquet id. Vivamus
pretium diam libero, ornare pulvinar metus facilisis et. Maecenas
feugiat, ante quis sodales feugiat, est lacus tincidunt turpis, sed
tempor dolor mauris ut urna. Sed nisl diam, gravida ut velit eget,
malesuada dictum mi. Cras tempor sapien id mauris molestie, iaculis
tempor dui sollicitudin. Phasellus in tellus sit amet erat posuere
laoreet. Donec sem tortor, varius quis erat vitae, aliquet fringilla
ante. Nulla quis euismod massa. Morbi eleifend enim enim, nec
porttitor sapien pretium nec. Morbi eros leo, vulputate rhoncus
dictum non, ultrices sed est. Pellentesque elit odio, ultricies non
accumsan nec, vehicula at dui. Praesent aliquet eleifend est, sit
amet euismod turpis viverra non. Cras tempus tincidunt mi, in mollis
ipsum sodales vitae.

Mauris malesuada sed lorem eget facilisis. Donec ac ex in felis
egestas semper. Aenean eu porta urna. Sed efficitur purus eget
fringilla egestas. Ut fringilla facilisis ipsum, eget aliquet dolor
pellentesque laoreet. Maecenas molestie nec augue quis viverra.
Quisque accumsan suscipit sem, sodales semper libero posuere id.

Nunc faucibus viverra arcu, sed rutrum nisl tempus sed. Integer et
rutrum mi. Fusce ut ipsum sed enim tincidunt finibus. Donec sodales
semper sapien nec ultrices. Phasellus quis felis eros. Cras feugiat
mollis enim vel ultricies. Proin vitae nibh id risus tempus
facilisis. Mauris facilisis, ligula id sodales mattis, tellus neque
```

```
suscipit erat, in mollis leo mauris id velit."
                android:layout_below="@+id/textViewDetailsTitle"
                android:textSize="20dp"
                android:layout_margin="15dp" />

            <Button
                android:id="@+id/buttonShare"
                android:layout_width="match_parent"
                android:layout_height="wrap_content"
                android:text="Share"

android:layout_below="@+id/textViewDetailsDescription"
                android:layout_centerHorizontal="true" />

            <RatingBar
                android:id="@+id/ratingBarDetails"
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                android:layout_below="@+id/buttonShare"
                android:layout_centerHorizontal="true" />

            <TextView
                android:id="@+id/textViewDetailsCommentsTitle"
                android:layout_width="match_parent"
                android:layout_height="wrap_content"
                android:text="Comments"
                android:textSize="20dp"
                android:layout_below="@+id/ratingBarDetails"
                android:layout_margin="15dp" />

            <TextView
                android:id="@+id/textViewDetailsComments"
                android:layout_width="match_parent"
                android:layout_height="wrap_content"
                android:text="must go!!!\n\nNice place\n\nI love it"
                android:textSize="15dp"

android:layout_below="@+id/textViewDetailsCommentsTitle"
                android:layout_margin="15dp" />

        </RelativeLayout>

    </ScrollView>

</RelativeLayout>
```

fragment_home.xml

```
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="match_parent" >

    <WebView
```

```
        android:layout_width="match_parent"
        android:layout_height="match_parent"
        android:id="@+id/webViewHome"
        android:layout_above="@+id/relativeLayoutChangeContent"
        android:layout_alignParentStart="true" />

    <RelativeLayout
        android:id="@+id/relativeLayoutChangeContent"
        android:layout_width="fill_parent"
        android:layout_height="160dp"
        android:background="#DDDDDD"
        android:layout_alignParentBottom="true"
        android:layout_centerHorizontal="true">

        <TextView
            android:id="@+id/textViewChangeContentTitle"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:layout_margin="10dp"
            android:textSize="25dp"
            android:textColor="#000000"
            android:text="@string/title_change_content"
            android:layout_alignParentTop="true"
            android:layout_alignParentLeft="true"
            android:layout_alignParentStart="true" />

        <Button
            android:id="@+id/buttonChangeContent1"
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:text="Item 1"
            android:singleLine="true"
            android:ellipsize="marquee"
            android:layout_centerHorizontal="true"
            android:layout_marginLeft="10dp"
            android:layout_marginRight="10dp"
            android:layout_below="@+id/textViewChangeContentTitle"
/>

        <Button
            android:id="@+id/buttonChangeContent2"
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:text="Item 2"
            android:singleLine="true"
            android:ellipsize="marquee"
            android:layout_centerHorizontal="true"
            android:layout_marginLeft="10dp"
            android:layout_marginRight="10dp"
            android:layout_below="@+id/buttonChangeContent1" />
    </RelativeLayout>
</RelativeLayout>
```

menu_main.xml

```
<menu xmlns:android="http://schemas.android.com/apk/res/android">
    <item android:id="@+id/action_map"
        android:orderInCategory="0"
        android:icon="@drawable/ic_menu_mapmode"
        android:title="@string/title_floor_plan"
        android:showAsAction="always" />
</menu>
```

15.1.2.2 Application for exhibition owners

AboutActivity.java

```java
package radartools.radar.cuhk.edu.hk.radartools;

import android.support.v7.app.ActionBarActivity;
import android.os.Bundle;

public class AboutActivity extends ActionBarActivity {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_about);
    }

}
```

BeaconSettingActivity.java

```java
package radartools.radar.cuhk.edu.hk.radartools;

import android.app.Activity;
import android.content.Context;
import android.content.Intent;
import android.content.res.Configuration;
import android.hardware.Sensor;
import android.hardware.SensorEvent;
import android.hardware.SensorEventListener;
import android.hardware.SensorManager;
import android.net.Uri;
import android.os.AsyncTask;
import android.os.RemoteException;
import android.support.v7.app.ActionBarActivity;
import android.os.Bundle;
import android.util.Log;
import android.view.View;
import android.widget.Button;
import android.widget.TextView;
import android.widget.Toast;

import org.altbeacon.beacon.Beacon;
import org.altbeacon.beacon.BeaconConsumer;
import org.altbeacon.beacon.BeaconManager;
import org.altbeacon.beacon.BeaconParser;
import org.altbeacon.beacon.RangeNotifier;
```

```
import org.altbeacon.beacon.Region;
import org.apache.http.HttpResponse;
import org.apache.http.HttpStatus;
import org.apache.http.StatusLine;
import org.apache.http.client.HttpClient;
import org.apache.http.client.methods.HttpGet;
import org.apache.http.impl.client.DefaultHttpClient;
import org.json.JSONException;
import org.json.JSONObject;

import java.io.ByteArrayOutputStream;
import java.io.IOException;
import java.util.Collection;

public class BeaconSettingActivity extends ActionBarActivity
implements BeaconConsumer, SensorEventListener {
    int id, major, minor, angle1, angle2;
    String uuid, title;

    String currentUuid = "";
    int currentMajor, currentMinor, currentAzimuth = 0;

    TextView uuidValue, majorValue, minorValue, angleValue;
    Button buttonBeacon, buttonAngle1, buttonAngle2, buttonSave;

    BeaconManager beaconManager;
    SensorManager sensorManager;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_beacon_setting);

        Bundle extras = getIntent().getExtras();
        id = extras.getInt("id", 0);
        uuid = extras.getString("uuid", "");
        title = extras.getString("title", "");
        major = extras.getInt("major", 0);
        minor = extras.getInt("minor", 0);
        angle1 = extras.getInt("angle1", 0);
        angle2 = extras.getInt("angle2", 360);

        // initialize beacon scanning
        beaconManager =
BeaconManager.getInstanceForApplication(this);
        beaconManager.getBeaconParsers().add(new
BeaconParser().setBeaconLayout("m:2-3=0215,i:4-19,i:20-21,i:22-
23,p:24-24"));
        beaconManager.setBackgroundBetweenScanPeriod(0l);
        beaconManager.setBackgroundScanPeriod(1000l);
        beaconManager.setForegroundBetweenScanPeriod(0l);
        beaconManager.setForegroundScanPeriod(1000l);
        beaconManager.bind(this);

        // initialize sensor
        sensorManager = (SensorManager)
```

```java
getSystemService(Context.SENSOR_SERVICE);
    }

    private void initializeUI() {
        setTitle(title + " Settings");

        uuidValue = (TextView) findViewById(R.id.textViewUuidValue);
        majorValue = (TextView)
findViewById(R.id.textViewMajorValue);
        minorValue = (TextView)
findViewById(R.id.textViewMinorValue);
        angleValue = (TextView)
findViewById(R.id.textViewAngleValue);

        buttonBeacon = (Button) findViewById(R.id.buttonBeacon);
        buttonAngle1 = (Button) findViewById(R.id.buttonAngle1);
        buttonAngle2 = (Button) findViewById(R.id.buttonAngle2);
        buttonSave = (Button) findViewById(R.id.buttonSave);

        uuidValue.setSelected(true);

        // update text views to show original values
        if (uuid.isEmpty()) {
            uuidValue.setText("Unknown");
            majorValue.setText("Unknown");
            minorValue.setText("Unknown");
        } else {
            uuidValue.setText(uuid);
            majorValue.setText(Integer.toString(major));
            minorValue.setText(Integer.toString(minor));
        }
        angleValue.setText(angle1 + " to " + angle2);

        buttonBeacon.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                uuid = currentUuid;
                major = currentMajor;
                minor = currentMinor;
                if (uuid.isEmpty()) {
                    uuidValue.setText("Unknown");
                    majorValue.setText("Unknown");
                    minorValue.setText("Unknown");
                } else {
                    uuidValue.setText(uuid);
                    majorValue.setText(Integer.toString(major));
                    minorValue.setText(Integer.toString(minor));
                }
            }
        });

        buttonAngle1.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                angle1 = currentAzimuth;
                angleValue.setText(angle1 + " to " + angle2);
```

```java
            }
        });

        buttonAngle2.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                angle2 = currentAzimuth;
                angleValue.setText(angle1 + " to " + angle2);
            }
        });

        buttonSave.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                new SaveTask().execute(Integer.toString(id), uuid,
Integer.toString(major), Integer.toString(minor),
Integer.toString(angle1), Integer.toString(angle2));
            }
        });
    }

    @Override
    public void onResume() {
        super.onResume();
        sensorManager.registerListener(this,
sensorManager.getDefaultSensor(Sensor.TYPE_ORIENTATION),
SensorManager.SENSOR_DELAY_FASTEST);

        initializeUI();
    }

    @Override
    public void onPause() {
        super.onPause();
        sensorManager.unregisterListener(this);
    }

    @Override
    protected void onDestroy() {
        super.onDestroy();
        beaconManager.unbind(this);
    }

    @Override
    public void onConfigurationChanged(Configuration newConfig)
    {
        super.onConfigurationChanged(newConfig);
        setContentView(R.layout.activity_beacon_setting);

        initializeUI();
    }

    @Override
    public void onBeaconServiceConnect() {
        beaconManager.setRangeNotifier(new RangeNotifier() {
            @Override
```

```java
            public void didRangeBeaconsInRegion(Collection<Beacon>
beacons, Region region) {
                // find beacon with smallest distance
                String minID1 = "", minID2 = "0", minID3 = "0";
                double minDistance = Double.MAX_VALUE;
                for (Beacon b : beacons) {
                    if (b.getDistance() < minDistance) {
                        minDistance = b.getDistance();

                        minID1 = b.getId1().toString();
                        minID2 = b.getId2().toString();
                        minID3 = b.getId3().toString();
                    }
                }
                if (minDistance < Double.MAX_VALUE) {
                    currentUuid = minID1.replace("-",
"").toUpperCase();

                    currentMajor = Integer.parseInt(minID2);
                    currentMinor = Integer.parseInt(minID3);

                    runOnUiThread(new Runnable() {
                        @Override
                        public void run() {
                            buttonBeacon.setEnabled(true);
                            buttonBeacon.setText("Set Beacon ID");
                        }
                    });
                }
            }
        });

        try {
            beaconManager.startRangingBeaconsInRegion(new
Region("myRangingUniqueId", null, null, null));
        } catch (RemoteException e) {
        }
    }

    @Override
    public void onAccuracyChanged(Sensor sensor, int accuracy) {

    }

    @Override
    public void onSensorChanged(SensorEvent event) {
        // update compass bearing
        currentAzimuth = (int)(event.values[0]) % 360;
    }

    protected class SaveTask extends AsyncTask<String, Void, String>
{

        @Override
        protected String doInBackground(String... params) {
            try {
                String apiURL =
```

```java
                "http://appsrv.cse.cuhk.edu.hk/~twyeung2/api/";
                HttpClient httpClient = new DefaultHttpClient();
                HttpResponse response = httpClient.execute(new
HttpGet(apiURL + "set/?id=" + Uri.encode(params[0]) + "&uuid=" +
Uri.encode(params[1]) + "&major=" + Uri.encode(params[2]) +
"&minor=" + Uri.encode(params[3]) + "&angle1=" +
Uri.encode(params[4]) + "&angle2=" + Uri.encode(params[5])));
                StatusLine statusLine = response.getStatusLine();

                runOnUiThread(new Runnable() {
                    @Override
                    public void run() {
                        buttonSave.setEnabled(false);
                    }
                });

                if (statusLine.getStatusCode() == HttpStatus.SC_OK)
{
                    ByteArrayOutputStream loginOut = new
ByteArrayOutputStream();
                    response.getEntity().writeTo(loginOut);
                    loginOut.close();

                    return loginOut.toString();
                }
                else {
                    response.getEntity().getContent().close();
                    throw new
IOException(statusLine.getReasonPhrase());
                }
            }
            catch (Exception e) {
                // Unstable network
                Toast.makeText(getApplicationContext(), "Network
error. Please try again.", Toast.LENGTH_SHORT).show();
                runOnUiThread(new Runnable() {
                    @Override
                    public void run() {
                        buttonSave.setEnabled(true);
                    }
                });
                return "";
            }
        }

        @Override
        protected void onPostExecute(String s) {
            if (s.equals("")) return;

            try {
                JSONObject res = new JSONObject(s);

                // handle error
                if (res.getInt("status") == 2) {
                    Toast.makeText(getApplicationContext(),
"Database error. Please try again.", Toast.LENGTH_SHORT).show();
```

```
                }
                else if (res.getInt("status") == 1) {
                    Toast.makeText(getApplicationContext(), "Invalid
data", Toast.LENGTH_SHORT).show();
                }

                // return data to ListofBeaconActivity
                else {
                    Toast.makeText(getApplicationContext(), "Commit
successful!", Toast.LENGTH_SHORT).show();

                    Intent resultData = new Intent();
                    resultData.putExtra("uuid", uuid);
                    resultData.putExtra("major", major);
                    resultData.putExtra("minor", minor);
                    resultData.putExtra("angle1", angle1);
                    resultData.putExtra("angle2", angle2);
                    setResult(Activity.RESULT_OK, resultData);
                    BeaconSettingActivity.this.finish();
                }
            } catch (JSONException e) {
                Toast.makeText(getApplicationContext(), "Database
error. Please try again.", Toast.LENGTH_SHORT).show();
            }

            runOnUiThread(new Runnable() {
                @Override
                public void run() {
                    buttonSave.setEnabled(true);
                }
            });
        }
    }
}
```

ListofBeaconsActivity.java

```
package radartools.radar.cuhk.edu.hk.radartools;

import android.content.Intent;
import android.support.v7.app.ActionBarActivity;
import android.os.Bundle;
import android.view.View;
import android.widget.AdapterView;
import android.widget.ArrayAdapter;
import android.widget.ListView;
import android.widget.Toast;

import org.json.JSONArray;
import org.json.JSONException;
import org.json.JSONObject;

import java.util.ArrayList;
import java.util.List;
```

```java
public class ListofBeaconsActivity extends ActionBarActivity {

    ListView listViewListofBeacons;
    JSONArray itemList;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_listof_beacons);

        Bundle extras = getIntent().getExtras();
        try {
            itemList = new JSONArray(extras.getString("data",
"[]"));
        } catch (JSONException e) {
            itemList = new JSONArray();
        }
    }

    private void initializeUI() {
        listViewListofBeacons = (ListView)
findViewById(R.id.listViewListofBeacons);

        List<String> arrayListListofBeacons = new
ArrayList<String>();

        for (int i = 0; i < itemList.length(); i++) {
            try {
                JSONObject item = itemList.getJSONObject(i);
                if (item.getString("uuid").isEmpty() ||
(item.getInt("major") == 0 && item.getInt("major") == 0)) {

arrayListListofBeacons.add(item.getString("title"));
                } else {

arrayListListofBeacons.add(item.getString("title") + "
(Completed)");
                }
            } catch (JSONException e) {
                arrayListListofBeacons.add("Unable to process this
item...");
            }
        }

        ArrayAdapter<String> arrayAdapterListView = new
ArrayAdapter<String>(
                this,
                android.R.layout.simple_list_item_1,
                arrayListListofBeacons);

        listViewListofBeacons.setAdapter(arrayAdapterListView);

        listViewListofBeacons.setOnItemClickListener(new
AdapterView.OnItemClickListener() {
            public void onItemClick(AdapterView parent, View v, int
position, long id){
```

```java
                Intent intent = new Intent(getApplicationContext(),
BeaconSettingActivity.class);
                try {
                    intent.putExtra("id",
itemList.getJSONObject(position).getInt("id"));
                    intent.putExtra("title",
itemList.getJSONObject(position).getString("title"));
                    intent.putExtra("uuid",
itemList.getJSONObject(position).getString("uuid"));
                    intent.putExtra("major",
itemList.getJSONObject(position).getInt("major"));
                    intent.putExtra("minor",
itemList.getJSONObject(position).getInt("minor"));
                    intent.putExtra("angle1",
itemList.getJSONObject(position).getInt("angle1"));
                    intent.putExtra("angle2",
itemList.getJSONObject(position).getInt("angle2"));

                    startActivityForResult(intent, position);
                } catch (JSONException e) {
                    Toast.makeText(getApplicationContext(), "Unable
to parse item details", Toast.LENGTH_SHORT).show();
                }
            }
        });
    }

    @Override
    public void onResume() {
        super.onResume();
        initializeUI();
    }

    @Override
    protected void onActivityResult(int position, int resultCode,
Intent data) {
        if (resultCode == RESULT_OK) {
            Bundle extra = data.getExtras();
            try {
                JSONObject item = itemList.getJSONObject(position);
                item.put("uuid", extra.getString("uuid"));
                item.put("major", extra.getInt("major"));
                item.put("minor", extra.getInt("minor"));
                item.put("angle1", extra.getInt("angle1"));
                item.put("angle2", extra.getInt("angle2"));

                initializeUI();
            } catch (JSONException e) {
                Toast.makeText(getApplicationContext(), "Unable to
parse item details", Toast.LENGTH_SHORT).show();
            }
        }
    }
}
```

MainActivity.java

```
package radartools.radar.cuhk.edu.hk.radartools;

import android.content.Context;
import android.content.Intent;
import android.net.Uri;
import android.os.AsyncTask;
import android.os.Bundle;
import android.support.v7.app.ActionBarActivity;
import android.util.Log;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.Toast;

import org.apache.http.HttpResponse;
import org.apache.http.HttpStatus;
import org.apache.http.StatusLine;
import org.apache.http.client.HttpClient;
import org.apache.http.client.methods.HttpGet;
import org.apache.http.impl.client.DefaultHttpClient;
import org.json.JSONException;
import org.json.JSONObject;

import java.io.ByteArrayOutputStream;
import java.io.IOException;

public class MainActivity extends ActionBarActivity {
    Button loginButton, aboutButton;
    EditText userField, passwordField;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
    }

    @Override
    public void onResume() {
        super.onResume();

        userField = (EditText)findViewById(R.id.userField);
        passwordField = (EditText)findViewById(R.id.passwordField);
        loginButton = (Button)findViewById(R.id.loginButton);
        aboutButton = (Button)findViewById(R.id.aboutButton);

        loginButton.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                loginButton.setEnabled(false);
                String user = userField.getText().toString();
                String pass = passwordField.getText().toString();
                new LoginTask(getApplicationContext()).execute(user,
pass);
            }
        });
```

```java
        aboutButton.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                Intent intent = new Intent(getApplicationContext(),
AboutActivity.class);
                startActivity(intent);
            }
        });
    }

    protected class LoginTask extends AsyncTask<String, Void,
String> {

        Context context;

        private LoginTask(Context context) {
            this.context = context.getApplicationContext();
        }

        @Override
        protected String doInBackground(String... params) {
            try {
                String apiURL =
"http://appsrv.cse.cuhk.edu.hk/~twyeung2/api/";
                HttpClient loginHttpClient = new
DefaultHttpClient();
                HttpResponse response = loginHttpClient.execute(new
HttpGet(apiURL + "auth/?user=" + Uri.encode(params[0]) + "&pass=" +
Uri.encode(params[1])));
                StatusLine loginStatusLine =
response.getStatusLine();

                runOnUiThread(new Runnable() {
                    @Override
                    public void run() {
                        loginButton.setEnabled(false);
                    }
                });

                if (loginStatusLine.getStatusCode() ==
HttpStatus.SC_OK) {
                    ByteArrayOutputStream loginOut = new
ByteArrayOutputStream();
                    response.getEntity().writeTo(loginOut);
                    loginOut.close();

                    return loginOut.toString();
                }
                else {
                    response.getEntity().getContent().close();
                    throw new
IOException(loginStatusLine.getReasonPhrase());
                }
            }
            catch (Exception e) {
                // Unstable network
```

```java
                Log.e("NETWORK ERROR", "");
                Toast.makeText(getApplicationContext(), "Network
error. Please try again.", Toast.LENGTH_SHORT).show();
                runOnUiThread(new Runnable() {
                    @Override
                    public void run() {
                        loginButton.setEnabled(true);
                    }
                });
                return "";
            }
        }

        @Override
        protected void onPostExecute(String s) {
            if (s.equals("")) return;

            try {
                JSONObject res = new JSONObject(s);

                // handle error
                if (res.getInt("status") == 2) {
                    Toast.makeText(getApplicationContext(),
"Database error. Please try again.", Toast.LENGTH_SHORT).show();
                }
                else if (res.getInt("status") == 1) {
                    Toast.makeText(getApplicationContext(), "Invalid
login credentials.", Toast.LENGTH_SHORT).show();
                }

                // launch ListofBeaconsActivity
                else {
                    Intent i = new Intent(MainActivity.this,
ListofBeaconsActivity.class).addFlags(Intent.FLAG_ACTIVITY_NEW_TASK)
;
                    i.putExtra("data",
res.getJSONArray("data").toString());
                    context.startActivity(i);
                }
            } catch (JSONException e) {
                Toast.makeText(getApplicationContext(), "Database
error. Please try again.", Toast.LENGTH_SHORT).show();
            }

            runOnUiThread(new Runnable() {
                @Override
                public void run() {
                    loginButton.setEnabled(true);
                }
            });
        }
    }
}
```

activity_about.xml

```
<RelativeLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
android:layout_width="match_parent"
    android:layout_height="match_parent"
android:paddingLeft="@dimen/activity_horizontal_margin"
    android:paddingRight="@dimen/activity_horizontal_margin"
    android:paddingTop="@dimen/activity_vertical_margin"
    android:paddingBottom="@dimen/activity_vertical_margin"

tools:context="radartools.radar.cuhk.edu.hk.radartools.AboutActivity
">

    <ScrollView
        android:layout_width="match_parent"
        android:layout_height="match_parent"
        android:id="@+id/scrollView"
        android:layout_alignParentTop="true"
        android:layout_centerHorizontal="true">

        <RelativeLayout
            android:layout_width="match_parent"
            android:layout_height="match_parent">

            <TextView
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                android:text="RadarTools"
                android:id="@+id/textViewAboutTitle"
                android:textSize="50dp"
                android:layout_alignParentTop="true"
                android:layout_centerHorizontal="true"
                android:layout_marginTop="100dp" />

            <TextView
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                android:text="NG Ping Him\nYEUNG Tak Wing"
                android:id="@+id/textViewAboutAuthors"
                android:textSize="30dp"
                android:gravity="center"
                android:layout_below="@+id/textViewAboutTitle"
                android:layout_centerHorizontal="true"
                android:layout_marginTop="50dp" />

            <TextView
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                android:text="CSE, CUHK\n2015"
                android:id="@+id/textViewAboutDepartment"
                android:textSize="20dp"
                android:gravity="center"
                android:layout_below="@+id/textViewAboutAuthors"
                android:layout_centerHorizontal="true"
                android:layout_marginTop="10dp" />
```

```
            <TextView
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                android:text="0.1"
                android:id="@+id/textViewAboutVersion"
                android:textSize="15dp"
                android:gravity="center"
                android:layout_below="@+id/textViewAboutDepartment"
                android:layout_centerHorizontal="true"
                android:layout_margin="10dp"/>
        </RelativeLayout>
    </ScrollView>

</RelativeLayout>
```

activity_beacon_setting.xml

```
<RelativeLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
android:layout_width="match_parent"
    android:layout_height="match_parent"
android:paddingLeft="@dimen/activity_horizontal_margin"
    android:paddingRight="@dimen/activity_horizontal_margin"
    android:paddingTop="@dimen/activity_vertical_margin"
    android:paddingBottom="@dimen/activity_vertical_margin"

tools:context="radartools.radar.cuhk.edu.hk.radartools.BeaconSetting
Activity">

    <ScrollView
        android:id="@+id/scrollViewBeaconSetting"
        android:layout_width="match_parent"
        android:layout_height="match_parent"
        android:layout_centerVertical="true"
        android:layout_centerHorizontal="true">

        <RelativeLayout
            android:id="@+id/relativeLayoutBeaconSetting"
            android:layout_width="match_parent"
            android:layout_height="match_parent">

            <TextView
                android:id="@+id/textViewBeaconSettingTitle"
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                android:text="Beacon Settings"
                android:textSize="40dp"
                android:gravity="center"
                android:layout_alignParentTop="true"
                android:layout_centerHorizontal="true" />

            <TextView
                android:id="@+id/textViewUuidKey"
                android:layout_width="wrap_content"
```

```
                    android:layout_height="wrap_content"
                    android:text="UUID"
                    android:textSize="16dp"

android:layout_below="@+id/textViewBeaconSettingTitle"
                    android:layout_alignParentStart="true"
                    android:layout_marginTop="20dp" />

            <TextView
                    android:id="@+id/textViewMajorKey"
                    android:layout_width="wrap_content"
                    android:layout_height="wrap_content"
                    android:text="Major"
                    android:textSize="16dp"
                    android:layout_below="@+id/textViewUuidKey"
                    android:layout_alignParentStart="true"
                    android:layout_marginTop="20dp" />

            <TextView
                    android:id="@+id/textViewMinorKey"
                    android:layout_width="wrap_content"
                    android:layout_height="wrap_content"
                    android:text="Minor"
                    android:textSize="16dp"
                    android:layout_below="@+id/textViewMajorKey"
                    android:layout_alignParentStart="true"
                    android:layout_marginTop="20dp" />

            <TextView
                    android:id="@+id/textViewAngleKey"
                    android:layout_width="wrap_content"
                    android:layout_height="wrap_content"
                    android:text="Angle"
                    android:textSize="16dp"
                    android:layout_below="@+id/textViewMinorKey"
                    android:layout_alignParentStart="true"
                    android:layout_marginTop="20dp" />

            <TextView
                    android:id="@+id/textViewUuidValue"
                    android:layout_width="wrap_content"
                    android:layout_height="wrap_content"
                    android:text="Lorem Ipsum is simply dummy text of
the printing and typesetting industry. Lorem Ipsum has been the
industry's standard dummy text ever since the 1500s"
                    android:textSize="16dp"
                    android:singleLine="true"
                    android:layout_alignParentLeft="true"
                    android:ellipsize="marquee"
                    android:fadingEdge="horizontal"
                    android:marqueeRepeatLimit="marquee_forever"
                    android:scrollHorizontally="true"

android:layout_below="@+id/textViewBeaconSettingTitle"
                    android:layout_marginLeft="50dp"
                    android:layout_marginTop="20dp" />
```

```xml
<TextView
    android:id="@+id/textViewMajorValue"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="3943"
    android:textSize="16dp"
    android:layout_alignParentLeft="true"
    android:layout_below="@+id/textViewUuidValue"
    android:layout_marginLeft="50dp"
    android:layout_marginTop="20dp" />

<TextView
    android:id="@+id/textViewMinorValue"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="6000"
    android:textSize="16dp"
    android:layout_alignParentLeft="true"
    android:layout_below="@+id/textViewMajorValue"
    android:layout_marginLeft="50dp"
    android:layout_marginTop="20dp" />

<TextView
    android:id="@+id/textViewAngleValue"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="0 to 360"
    android:textSize="16dp"
    android:layout_alignParentLeft="true"
    android:layout_below="@+id/textViewMinorValue"
    android:layout_marginLeft="50dp"
    android:layout_marginTop="20dp" />

<Button
    android:id="@+id/buttonBeacon"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:text="No beacon detected yet..."
    android:layout_marginTop="30dp"
    android:layout_below="@+id/textViewAngleValue"
    android:enabled="false" />

<Button
    android:id="@+id/buttonAngle1"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:text="Set right bearing"
    android:layout_marginTop="10dp"
    android:layout_below="@+id/buttonBeacon" />

<Button
    android:id="@+id/buttonAngle2"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:text="Set left bearing"
```

```
                android:layout_marginTop="10dp"
                android:layout_below="@+id/buttonAngle1" />

        <Button
                android:id="@+id/buttonSave"
                android:layout_width="match_parent"
                android:layout_height="wrap_content"
                android:text="Save settings"
                android:layout_marginTop="10dp"
                android:layout_below="@+id/buttonAngle2" />

    </RelativeLayout>

    </ScrollView>

</RelativeLayout>
```

activity_listof_beacons.xml

```
<RelativeLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
android:layout_width="match_parent"
    android:layout_height="match_parent"
android:paddingLeft="@dimen/activity_horizontal_margin"
    android:paddingRight="@dimen/activity_horizontal_margin"
    android:paddingTop="@dimen/activity_vertical_margin"
    android:paddingBottom="@dimen/activity_vertical_margin"

tools:context="radartools.radar.cuhk.edu.hk.radartools.ListofBeacons
Activity">


    <ListView
        android:id="@+id/listViewListofBeacons"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:layout_centerVertical="true"
        android:layout_centerHorizontal="true" />
</RelativeLayout>
```

activity_main.xml

```
<RelativeLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
android:layout_width="match_parent"
    android:layout_height="match_parent"
android:paddingLeft="@dimen/activity_horizontal_margin"
    android:paddingRight="@dimen/activity_horizontal_margin"
    android:paddingTop="@dimen/activity_vertical_margin"
    android:paddingBottom="@dimen/activity_vertical_margin"
tools:context=".MainActivity">
```

```
<ScrollView
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:layout_centerVertical="true"
    android:layout_centerHorizontal="true"
    android:id="@+id/scrollView">

    <RelativeLayout
        android:id="@+id/relativeLayoutMain"
        android:layout_width="match_parent"
        android:layout_height="match_parent">

        <TextView
            android:id="@+id/textViewTitle"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:text="Welcome to Radar Tools"
            android:textSize="40dp"
            android:layout_margin="10dp"
            android:gravity="center"
            android:layout_alignParentTop="true"
            android:layout_centerHorizontal="true"
            android:layout_alignParentEnd="true" />

        <EditText
            android:id="@+id/userField"
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:layout_below="@+id/textViewTitle"
            android:layout_centerHorizontal="true"
            android:layout_marginTop="20dp"
            android:editable="true"
            android:inputType="text"
            android:hint="USER NAME" />

        <EditText
            android:id="@+id/passwordField"
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:layout_below="@+id/userField"
            android:layout_centerHorizontal="true"
            android:layout_marginTop="10dp"
            android:editable="true"
            android:inputType="textPassword"
            android:password="true"
            android:hint="PASSWORD" />

        <Button
            android:id="@+id/loginButton"
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:text="LOGIN"
            android:layout_below="@+id/passwordField"
            android:layout_centerHorizontal="true"
            android:layout_marginTop="10dp" />
```

```
            <Button
                android:id="@+id/aboutButton"
                android:layout_width="match_parent"
                android:layout_height="wrap_content"
                android:text="ABOUT"
                android:layout_below="@+id/loginButton"
                android:layout_centerHorizontal="true"
                android:layout_marginTop="10dp" />
        </RelativeLayout>
    </ScrollView>
</RelativeLayout>
```

menu_main.xml

```
<menu xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"

tools:context="radartools.radar.cuhk.edu.hk.radartools.AboutActivity
">
    <item android:id="@+id/action_settings"
android:title="@string/action_settings"
        android:orderInCategory="100" app:showAsAction="never" />
</menu>
```

menu_beacon_setting.xml

```
<menu xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"

tools:context="radartools.radar.cuhk.edu.hk.radartools.BeaconSetting
Activity">
    <item android:id="@+id/action_settings"
android:title="@string/action_settings"
        android:orderInCategory="100" app:showAsAction="never" />
</menu>
```

menu_listof_beacons.xml

```
<menu xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"

tools:context="radartools.radar.cuhk.edu.hk.radartools.ListofBeacons
Activity">
    <item android:id="@+id/action_settings"
android:title="@string/action_settings"
        android:orderInCategory="100" app:showAsAction="never" />
</menu>
```

menu_main.xml

```
<menu xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
```

```
    xmlns:tools="http://schemas.android.com/tools"
tools:context=".MainActivity">
    <item android:id="@+id/action_settings"
android:title="@string/action_settings"
        android:orderInCategory="100" app:showAsAction="never" />
</menu>
```

15.1.3   Database

lyu1403_cms_auth

```
CREATE TABLE IF NOT EXISTS `lyu1403_cms_auth` (
  `apikey` char(32) NOT NULL,
  `username` varchar(64) NOT NULL,
  `password` varchar(32) NOT NULL,
  `quota` int(11) NOT NULL,
  PRIMARY KEY  (`apikey`),
  UNIQUE KEY `username` (`username`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8;
```

lyu1403_cms_beacon

```
CREATE TABLE IF NOT EXISTS `lyu1403_cms_beacon` (
  `uuid` char(32) NOT NULL,
  `major` int(11) NOT NULL,
  `minor` int(11) NOT NULL,
  `exhibition` char(32) NOT NULL,
  UNIQUE KEY `uuid` (`uuid`,`major`,`minor`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8;
```

lyu1403_cms_exhibition

```
CREATE TABLE IF NOT EXISTS `lyu1403_cms_exhibition` (
  `user` char(32) NOT NULL,
  `title` varchar(512) NOT NULL,
  `titleTC` varchar(512) NOT NULL,
  `description` mediumtext NOT NULL,
  `descriptionTC` mediumtext NOT NULL,
  `image` varchar(1024) NOT NULL,
  `floorplan` varchar(1024) NOT NULL,
  `title_prev` varchar(512) NOT NULL,
  `titleTC_prev` varchar(512) NOT NULL,
  `description_prev` mediumtext NOT NULL,
  `descriptionTC_prev` mediumtext NOT NULL,
  `image_prev` varchar(1024) NOT NULL,
  `floorplan_prev` varchar(1024) NOT NULL,
  `title_next` varchar(512) NOT NULL,
  `titleTC_next` varchar(512) NOT NULL,
  `description_next` mediumtext NOT NULL,
  `descriptionTC_next` mediumtext NOT NULL,
  `image_next` varchar(1024) NOT NULL,
  `floorplan_next` varchar(1024) NOT NULL,
  PRIMARY KEY  (`user`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8;
```

lyu1403_cms_item

```
CREATE TABLE IF NOT EXISTS `lyu1403_cms_item` (
  `id` int(11) NOT NULL,
  `user` char(32) NOT NULL,
  `uuid` char(32) NOT NULL,
  `major` int(11) NOT NULL,
  `minor` int(11) NOT NULL,
  `angle1` int(11) NOT NULL default '0',
  `angle2` int(11) NOT NULL default '360',
  `locationX` int(11) NOT NULL,
  `locationY` int(11) NOT NULL,
  `category` varchar(20) NOT NULL,
  `title` varchar(512) NOT NULL,
  `titleTC` varchar(512) NOT NULL,
  `description` mediumtext NOT NULL,
  `descriptionTC` mediumtext NOT NULL,
  `photos` mediumtext NOT NULL,
  `photosTC` mediumtext NOT NULL,
  `audio` varchar(4096) NOT NULL,
  `audioTC` varchar(4096) NOT NULL,
  `video` varchar(4096) NOT NULL,
  `videoTC` varchar(4096) NOT NULL,
  `youtube` varchar(50) NOT NULL,
  `youtubeTC` varchar(50) NOT NULL,
  PRIMARY KEY  (`id`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8;
```

lyu1403_cms_item_next

```
CREATE TABLE IF NOT EXISTS `lyu1403_cms_item_next` (
  `id` int(11) NOT NULL auto_increment,
  `user` char(32) NOT NULL,
  `uuid` char(32) NOT NULL,
  `major` int(11) default NULL,
  `minor` int(11) default NULL,
  `angle1` int(11) NOT NULL default '0',
  `angle2` int(11) NOT NULL default '360',
  `locationX` int(11) NOT NULL,
  `locationY` int(11) NOT NULL,
  `category` varchar(20) NOT NULL,
  `title` varchar(512) NOT NULL,
  `titleTC` varchar(512) NOT NULL,
  `description` mediumtext NOT NULL,
  `descriptionTC` mediumtext NOT NULL,
  `photos` mediumtext NOT NULL,
  `photosTC` mediumtext NOT NULL,
  `audio` varchar(4096) NOT NULL,
  `audioTC` varchar(4096) NOT NULL,
  `video` varchar(4096) NOT NULL,
  `videoTC` varchar(4096) NOT NULL,
  `youtube` varchar(50) NOT NULL,
  `youtubeTC` varchar(50) NOT NULL,
  PRIMARY KEY  (`id`)
) ENGINE=InnoDB  DEFAULT CHARSET=utf8 AUTO_INCREMENT=1 ;
```

lyu1403_cms_item_prev

```
CREATE TABLE IF NOT EXISTS `lyu1403_cms_item_prev` (
  `id` int(11) NOT NULL,
  `user` char(32) NOT NULL,
  `uuid` char(32) NOT NULL,
  `major` int(11) NOT NULL,
  `minor` int(11) NOT NULL,
  `angle1` int(11) NOT NULL default '0',
  `angle2` int(11) NOT NULL default '360',
  `locationX` int(11) NOT NULL,
  `locationY` int(11) NOT NULL,
  `category` varchar(20) NOT NULL,
  `title` varchar(512) NOT NULL,
  `titleTC` varchar(512) NOT NULL,
  `description` mediumtext NOT NULL,
  `descriptionTC` mediumtext NOT NULL,
  `photos` mediumtext NOT NULL,
  `photosTC` mediumtext NOT NULL,
  `audio` varchar(4096) NOT NULL,
  `audioTC` varchar(4096) NOT NULL,
  `video` varchar(4096) NOT NULL,
  `videoTC` varchar(4096) NOT NULL,
  `youtube` varchar(50) NOT NULL,
  `youtubeTC` varchar(50) NOT NULL,
  PRIMARY KEY  (`id`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8;
```

lyu1403_cms_location

```
CREATE TABLE IF NOT EXISTS `lyu1403_cms_location` (
  `user` char(32) NOT NULL,
  `id` varchar(20) NOT NULL,
  `description` varchar(256) NOT NULL,
  UNIQUE KEY `user` (`user`,`id`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8;
```

lyu1403_cms_log

```
CREATE TABLE IF NOT EXISTS `lyu1403_cms_log` (
  `installationID` char(32) NOT NULL,
  `item` int(11) NOT NULL,
  `last_visit` int(11) NOT NULL,
  `rating` int(1) default NULL,
  `comment` varchar(1024) default NULL,
  UNIQUE KEY `installationID` (`installationID`,`item`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8;
```