



LYU 1103

Digital Interactive Game Interface Table Apps for iPad

Supervised by: Professor Michael R. Lyu

Student: Ng Ka Hung (1009615714)
Chan Hing Faat (1009618344)

Year 2011 – 2012 Final Year Project



Department of Computer Science and Engineering
The Chinese University of Hong Kong



 i.Digi.T.able

Term 1 review

New Ideas , new target

Our work

Implementation

Conclusion

What is AR?



i.Digi.T.able

Combination of reality

+

Computer generated graphics

Interactive & digitally manipulable

Inspiration



i.Digi.T.able

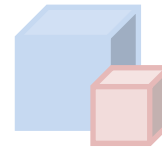
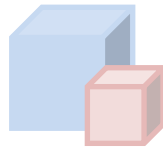
Digi.T.able (2007)

- Allows players in different places to play games by real objects
- Share a same common space

Implement on iPad

i.Digi.T.able

2 iPad shares a common AR space to play a game



i.Digi.T.able

- Track the real-object mark and determine the camera's position
- Display simple objects on virtual space depends on real space scenes
- Exchange position information between 2 iPad clients
- Implement a simple AR game on iOS platform (iPad)

iOS

 i.Digi.T.able

Development tools



Objective-C on **Xcode**



vuforia
by Qualcomm



Development tools



The game

 i.Digi.T.able

A demo game

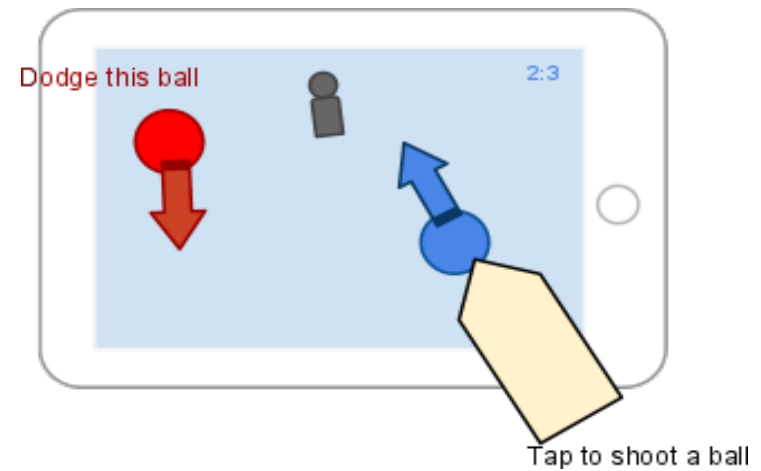
Dodge ball

- 2-player battle version

SETUP

- A marker on the wall
- 2 iPads with app installed
- Server ready

Game interface



The game



i.Digi.T.able

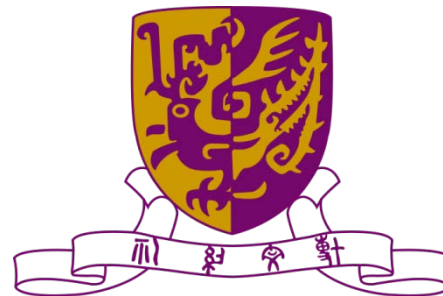
A demo game

Dodge ball

Control

- Move around the device to move
- Tap to throw a ball

Target marker



The game



Admin view on web interface

DEMO

The screenshot displays the "iDigiTable - Admin view" interface. At the top, there is a header with "View as" set to "Admin" and a "重設" (Reset) button. Below the header, there is a legend for "Device A" (red dot) and "Device B" (blue dot). A text box contains the following information:

```
[mouse:326, 203] (click to shoot a ball)  
  
device A: 2zn6B6dkw4wd29asckaaklnzx1wmq21o  
device B: jftd9rvlKkw6ccpkj2u110aer3vmad  
device A: {"x":-100,"y":0,"z":0}  
device B: {"x":7.168862,"y":3.465492,"z":405.424988}  
event[A]:  
event[B]:
```

The main area of the interface is a 2D game space with a light gray background and a grid. Two balls are visible: a large red ball (Device A) and a smaller blue ball (Device B). The red ball is positioned to the left of the blue ball, and they are partially overlapping.

The game



i.Digi.T.able

Limitations

- Unstable network
- Uncomfortable control
- Not enough AR effect demonstrated

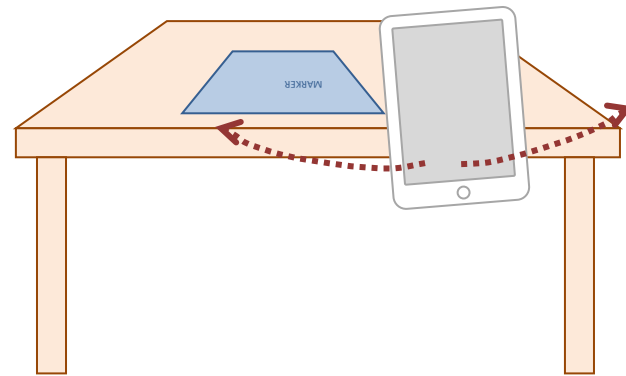
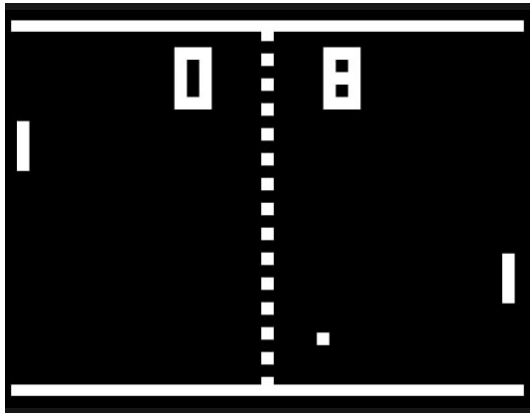
Design
Design

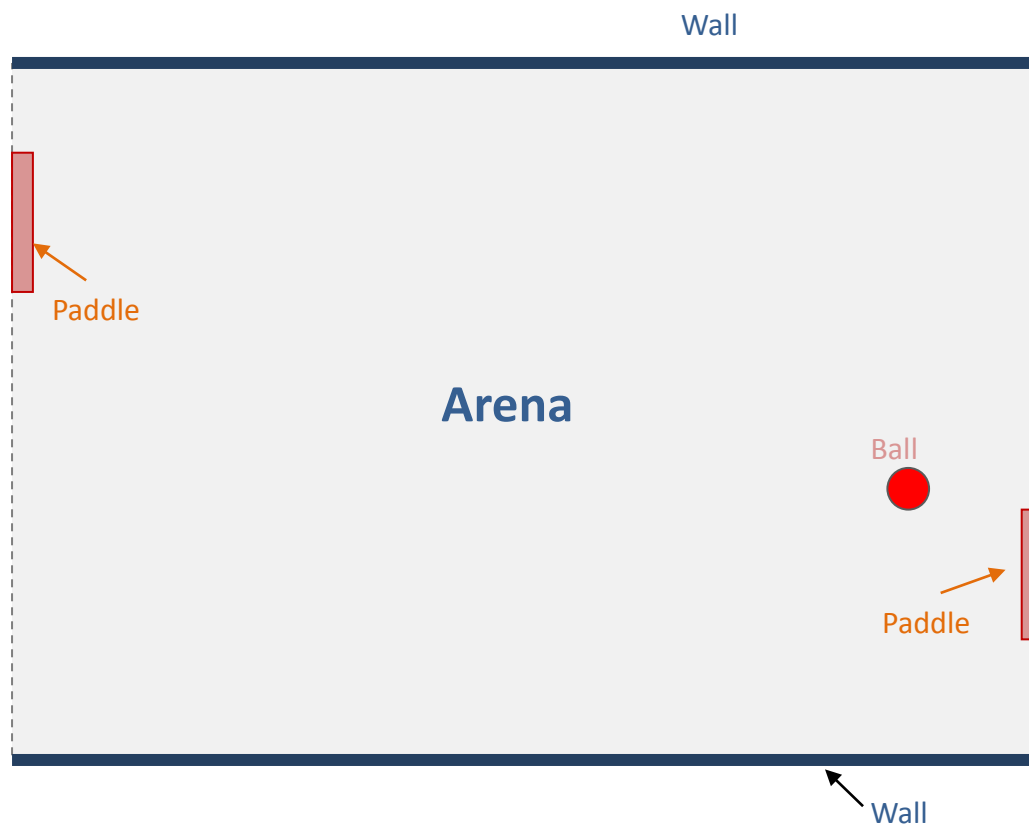
 i.Digi.T.able



New Idea, new target

Game- Pong





Focus

- Better control
- Better networking support
- Improved AR experience

Game options

- Single game (with AI bot)

Level of difficulties

Easy

Normal

Hard

Game options

- Online game (with user opponent)

[Connect](#)

[Choose as player 1 / 2](#)

[Play online](#)

Pong

 i.Digi.T.able

Single + multiplayer game



DEMO



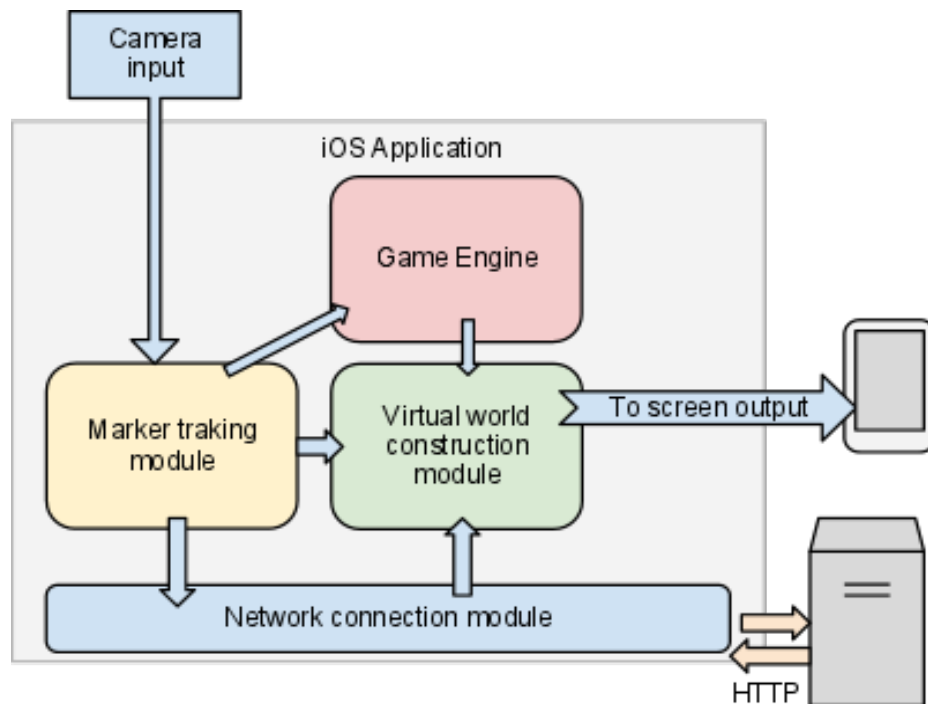
iDitable
Final year project 2012

Implementation



i.Digi.T.able

4 main components





Marker tracking

Qualcomm AR SDK (**Vuforia**)

- fetches live streaming from the device camera
- The platform consists of these components:
 - Camera
 - Image converter
 - Tracker
 - Renderer
 - Application Code
 - Target Resources



Implementation



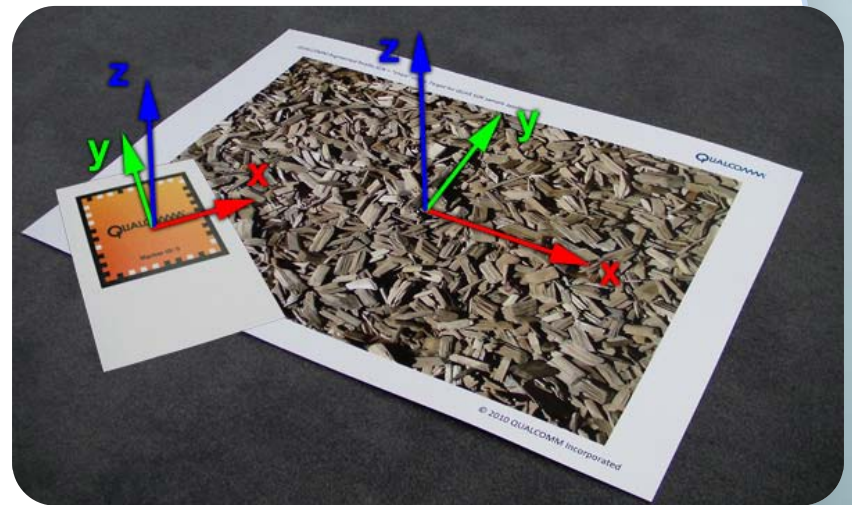
i.Digi.T.able

Marker tracking

Vuforia

-Trackable Markers

-right-handed coordinate system is used

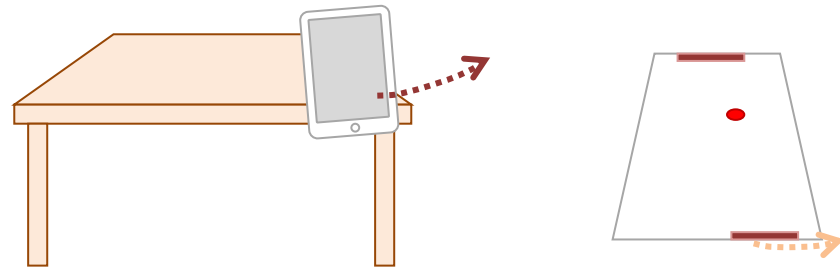




Marker tracking

Control

- Move iPad
- Paddle moves



Relative positioning vs absolute positioning

Design

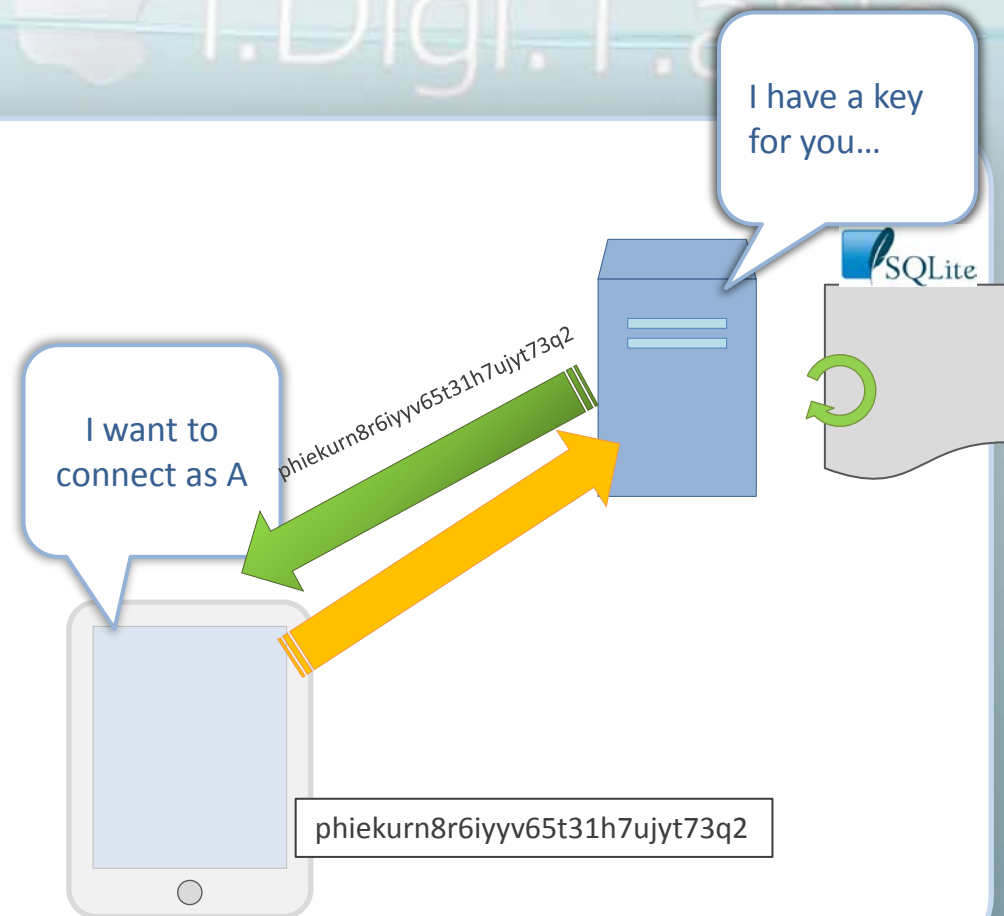


Network

Connection protocol

Register phase

- gets a token
- use the token to connect again
(due to HTTP's stateless property)



Network

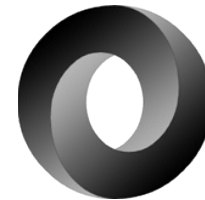
Server

Database based

- more efficient
- easier implementation

Network

Communication



JSON (JavaScript Object Notation)

- standard communication format
- many library support
- High writability
- High readability

```
{  
  "clientToken": "btfpm7d3qj7pagirfarvur64b5lk56",  
  "eventId": "2",  
  "eventType": 3,  
  "coordination": {  
    "x": 20,  
    "y": 30,  
    "z": 0  
  }  
}
```

Network

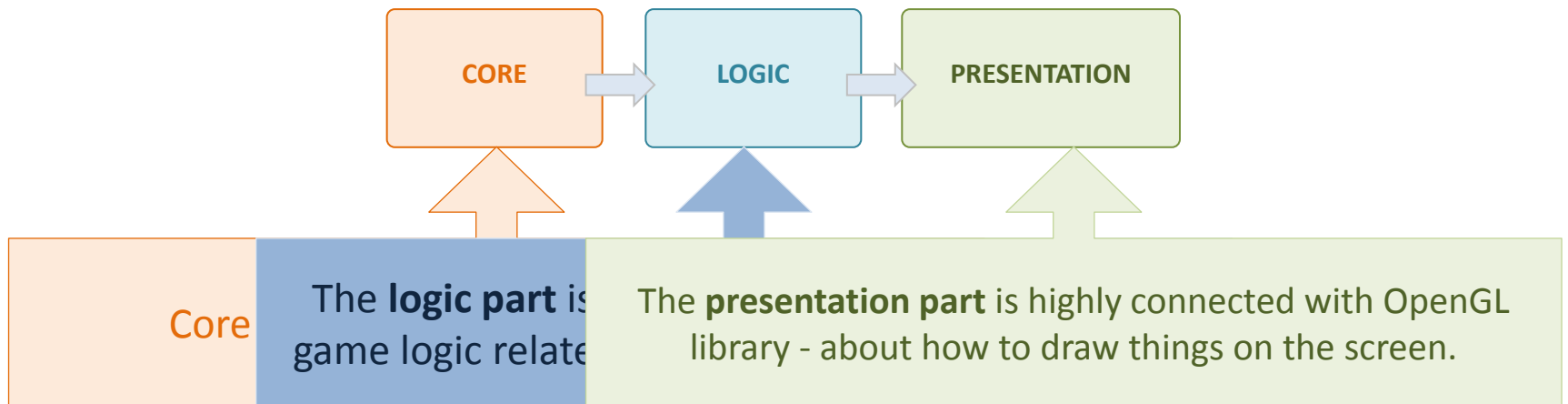
Communication

JSON



Game engine

Architecture



Game engine

Logic part

Game:	represents a Pong game.
Player:	represents a game player
Bot:	represents a computer controlled entity
Paddle:	represents the rectangular block for hitting the ball
Ball:	represents a block that bounces between players
Court:	represents the game arena
Motion:	represents the ball's motion states
Contact:	represents the contact point made by the ball and paddles

Game engine

Presentation part

Most of the game objects such as the paddles, the ball and the arena need to be shown on the screen. Hence, they are associated with models for presentation.

```
typedef struct _Model : Object {  
    int parentId;  
    bool hidden;  
    QCAR::Vec3F position;  
    QCAR::Vec3F scale;  
    QCAR::Matrix44F transform;  
} Model;
```

To summarize this semester

- Improvement on tracking AR marker
- Updated QCAR SDK
- Network modification
- Pong game

Overall in 2011- 2012

- Track the real-object marker -> determine the camera's position
- Display simple objects on virtual space depends on real space scenes
- Exchange position information between 2 iPad clients
- Implemented a simple AR game on iOS platform (iPad)

Issues...

- Programming on iOS
- Searching for suitable SDK
- Stabilize camera tracking
- Network Connection
- Investigate possibility for more clients

Q&A Section



i.Digi.T.able

Q & A

The end
The end



i.Digi.T.able

Thank you!
Thank you!