I/O Issues in C

Wang CHEN

CSCI2100B Data Structures Tutorial 3

Content

- **Introduction**
- **Input/Output Functions**
  - **printf()**
  - **scanf()**
  - **getchar(), putchar() and gets()**
- **Constants**
  - **Constants**
  - **#define**
  - **String Literal**

Content

- **Introduction**
- **Input/Output Functions**
  - **printf()**
  - **scanf()**
  - **getchar() , putchar() and gets()**
- **Constants**
  - **Constants**
  - **#define**
  - **String Literal**

How to read the input data and write the output data?

Exercise 1.22 *You are asked to write a C program to find the number of digits within a string.*

Input *The input consists of the number of test cases, m, in the first line and followed by m test cases.*

Each test case consists of a string with less than 256 characters

An example is as follows,

```
3
I hate CUSIS, I have failed my course registration 5 times.
Sherlock Holmes is looking for a flatmate to share a flat at 221B Baker Street
I won 5,000,000.00 dollars on 25 July 2010
```

Output *The output should be m lines of integer value. Each line should be the number of digits within that string.*

```
1
3
15
```

scanf("%d\n", &n);
gets(s1); // s1 is the
//1st sentence

scanf("%d", &n);
gets(s); // s == '\n'
gets(s1);

What’s on Judge System

```
config.txt  in1  in2  in3  in4  out1  out2  out3  out4
```

config.txt

```
1 CASE=4
2 INPUT=in%i
3 OUTPUT=out%i
4 TIME_LIMIT=1
5 MEM_LIMIT=32
```

int1

```
1 4
2 Hi12 3.00Hel loWorld111
3 123 45 67 890:a\bc.!
4 abcd efg wfwew fwadsfsdf
5 000 0099
```

out1

```
1 8
2 10
3 0
4 7
```

C program skeleton

- In short, the basic skeleton of a C program looks like this:

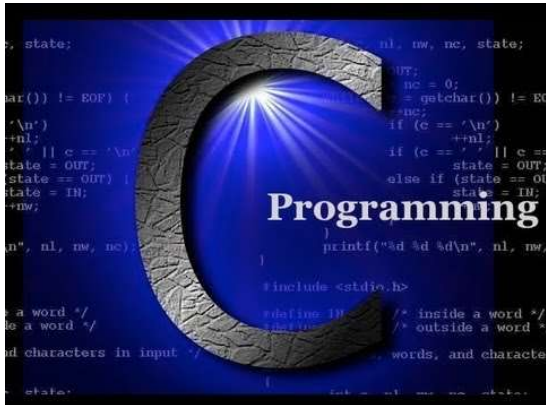
```
#include <stdio.h>
int main(void)
{
    statement(s);
    return(0);
}
```

Preprocessor directives

Function main

Start of segment

End of segment



Input/Output Operations

- **Input operation**
  - an instruction that copies data from an input device into memory
- **Output operation**
  - an instruction that displays information stored in memory to the output devices (such as the monitor screen)

Input/Output Functions

- A C function that performs an input or output operation
- A few functions that are pre-defined in the header file **<stdio.h>** such as :
  - ***printf()***
  - ***scanf()***
  - ***getchar()*** & ***putchar()*** & ***gets()***

Content

- Introduction
- **Input/Output Functions**
  - **printf()**
  - scanf()
  - getchar() , putchar() and gets()
- Constants
  - Constants
  - #define
  - String Literal

The *printf()* function

- Used to send data to the standard output (usually the monitor) to be printed according to specific format.
- General format:
  - `printf("string literal");`
    - A sequence of any number of characters surrounded by double quotation marks.
  - `printf("format string", variables);`
    - Format string is a combination of **text**, **conversion specifier** and **escape sequence**.

The *printf()* function cont…

- Example:
  - `printf("Thank you\n");`

```
Thank you
```

  - `printf ("Total sum is: %d\n", sum);`

```
Total sum is: 50
```

Assuming that the value of sum is 50

- **%d** is a **placeholder** (conversion specifier)
  - marks the display position for a type integer variable
  - Common Conversion Identifier used in printf function
- **\n** is an **escape sequence**
  - moves the cursor to the new line

	printf
int	%d
float	%f
double	%f
char	%c
string	%s

Placeholder/Conversion Specifier

No	Conversion Specifier	Output Type	Output Example
1	%d	Signed decimal integer	76
2	%i	Signed decimal integer	76
3	%o	Unsigned octal integer	134
4	%u	Unsigned decimal integer	76
5	%x	Unsigned hexadecimal (small letter)	9c
6	%X	Unsigned hexadecimal (capital letter)	9C
7	%f	Integer including decimal point	76.0000
8	%e	Signed floating point (using e notation)	7.6000e+01
9	%E	Signed floating point (using E notation)	7.6000E+01
10	%g	The shorter between %f and %e	76
11	%G	The shorter between %f and %E	76
12	%c	Character	‘7’
13	%s	String	‘76'

Escape Sequence

Escape Sequence	Effect
\a	Beep sound
\b	Backspace
\f	Formfeed (for printing)
\n	New line
\r	Carriage return
\t	Tab
\v	Vertical tab
\\	Backslash
\”	“ sign
\o	Octal decimal
\x	Hexadecimal
\0	NULL

Content

- Introduction
- Input/Output Functions
  - printf()
  - **scanf()**
  - getchar(), putchar() and gets()
- Constants
  - Constants
  - #define
  - String Literal

The scanf() function

- Read data from the standard input device (usually keyboard) and store it in a variable.
- General format:
  - `scanf("format string", &variable);`
- Notice ampersand (&) operator :
  - C address of operator
  - it passes the address of the variable instead of the variable itself
  - tells the scanf() where to find the variable to store the new value
- Format string is a combination of conversion specifier and escape sequence (if any).

The scanf() function cont…

- Common Conversion Identifier used in printf and scanf functions.

	printf	scanf
int	%d	%d
float	%f	%f
double	%f	%lf
char	%c	%c
string	%s	%s

- Example :

```
int age;
printf("Enter your age:");
scanf("%d", &age);
```

The scanf() function cont…

- If you want the user to enter more than one value, you serialize the inputs.
- Example:

```
float height, weight;

printf(“Please enter your height and
weight:”);
scanf(“%f%f”, &height, &weight);
```

Content

- Introduction
- **Input/Output Functions**
  - printf()
  - scanf()
  - **getchar() , putchar() and gets()**
- Constants / #define
- String Literal

getchar() and putchar()

- ***getchar()*** - read ***a*** character from standard input
- ***putchar()*** - write ***a*** character to standard output
- Example:

```
Please type a character: h
You have typed this character: h
```

```
#include <stdio.h>
int main(void)
{
   char my_char;
   printf("Please type a character:");
   my_char = getchar();
   printf("You have typed this character: ");
   putchar(my_char);
   return (0);
}
```

getchar() and putchar() cont

- Alternatively, you can write the previous code using normal ***printf*** / ***scanf*** and %c placeholder.
- Example:

```
Please type a character: h
You have typed this character: h
```

```
#include <stdio.h>
int main(void)
{
  char my_char;
  printf("Please type a character: ");
  scanf("%c",&my_char);
  printf("You have typed this character: %c", my_char);
  return(0);
}
```

gets()

- The C library function **char *gets(char *str)** reads a line from stdin and stores it into the string pointed to by str. It stops when either the newline character is read or when the end-of-file is reached, whichever comes first.
- Example:

```
#include <stdio.h>
int main()
{
   char str[50];
   printf("Enter a string : ");
   gets(str); // fgets(str,50,stdin);
   printf("You entered: %s", str);
   return(0);
}
```

```
Enter a string : tutorialspoint.com
You entered: tutorialspoint.com
```

Content

- Introduction
- Input/Output Functions
  - printf()
  - scanf()
  - getchar(), putchar() and gets()
- **Constants**
  - Constants
  - #define
  - String Literal

Content

- Introduction
- Input/Output Functions
  - printf()
  - scanf()
  - getchar(), putchar() and gets()
- Constants
  - **Constants**
  - #define
  - String Literal

Constants

- **Character constants**
  - A character enclosed in a single quotation mark
  - Example:
    - `const char letter = 'n';`
    - `const char number = '1';`
    - `printf("%c", 'S');`
- **Enumeration**
  - Values are given as a list
  - Example:
    - `enum Days { Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday };`

Constant example – volume of a cone

```
#include <stdio.h>

int main(void)
{
   const double pi = 3.412;
   double height, radius, base, volume;

   printf("Enter the height and radius of the cone:");
   scanf("%lf %lf", &height, &radius);

   base = pi * radius * radius;
   volume = (1.0/3.0) * base * height;

   printf("The volume of a cone is %f ", volume);
   return (0);
}
```

Content

- Introduction
- Input/Output Functions
  - printf()
  - scanf()
  - getchar(), putchar() and gets()
- Constants
  - Constants
  - **#define**
  - String Literal

#define

```
#include <stdio.h>
#define pi 3.142

int main(void)
{
  double height, radius, base, volume;

  printf("Enter the height and radius of the
  cone:");
  scanf("%lf %lf", &height, &radius);

  base = pi * radius * radius;
  volume = (1.0/3.0) * base * height;

  printf("The volume of a cone is %f ", volume);
  return (0);
}
```

Content

- Introduction
- Input/Output Functions
  - printf()
  - scanf()
  - getchar(), putchar() and gets()
- Constants
  - Constants
  - #define
  - **String Literal**

String Literal

- A sequence of any number of characters surrounded by double quotation marks “ ”.
- Example of usage in C program:

```
printf(“What a beautiful day.\n”);
```

```
What a beautiful day.
```

- To have double quotation marks as part of the sentence, precede the quote with backslash

```
printf(“He shouted \“stop!\” to the thief.\n”);
```

```
He shouted “stop!” to the thief.
```

Thanks!

Q&A