C Programming

Course Basics

Instructor

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Lectures

- two hours lectures
- 2~3 hours lab at 400202

Course Materials

- Textbook

  Kelley A., Pohl I, "A Book on C: Programming in C", Fourth Edition, Addison-Wesley, 1998, ISBN 0-201-18399-4.
  http://www.cs.ucsc.edu/~pohl/abc4.html
- Course Web - http://csl.skku.edu/GEDD007S11/Overview
- Laboratory
  - conducted by TA
  - lectures and programming exercises
- Homeworks
  - 5 individual homeworks

Academic Honesty

- All work submitted for credit must be your original ones.
- Cheating on lab or homework
  - "F" grade and a report to the department
- Cheating on examination
  - report to the president of SKKU

- No exception on dishonesty

All you have to know about Computer for C programming

All you have to know about Computer for C programming 2

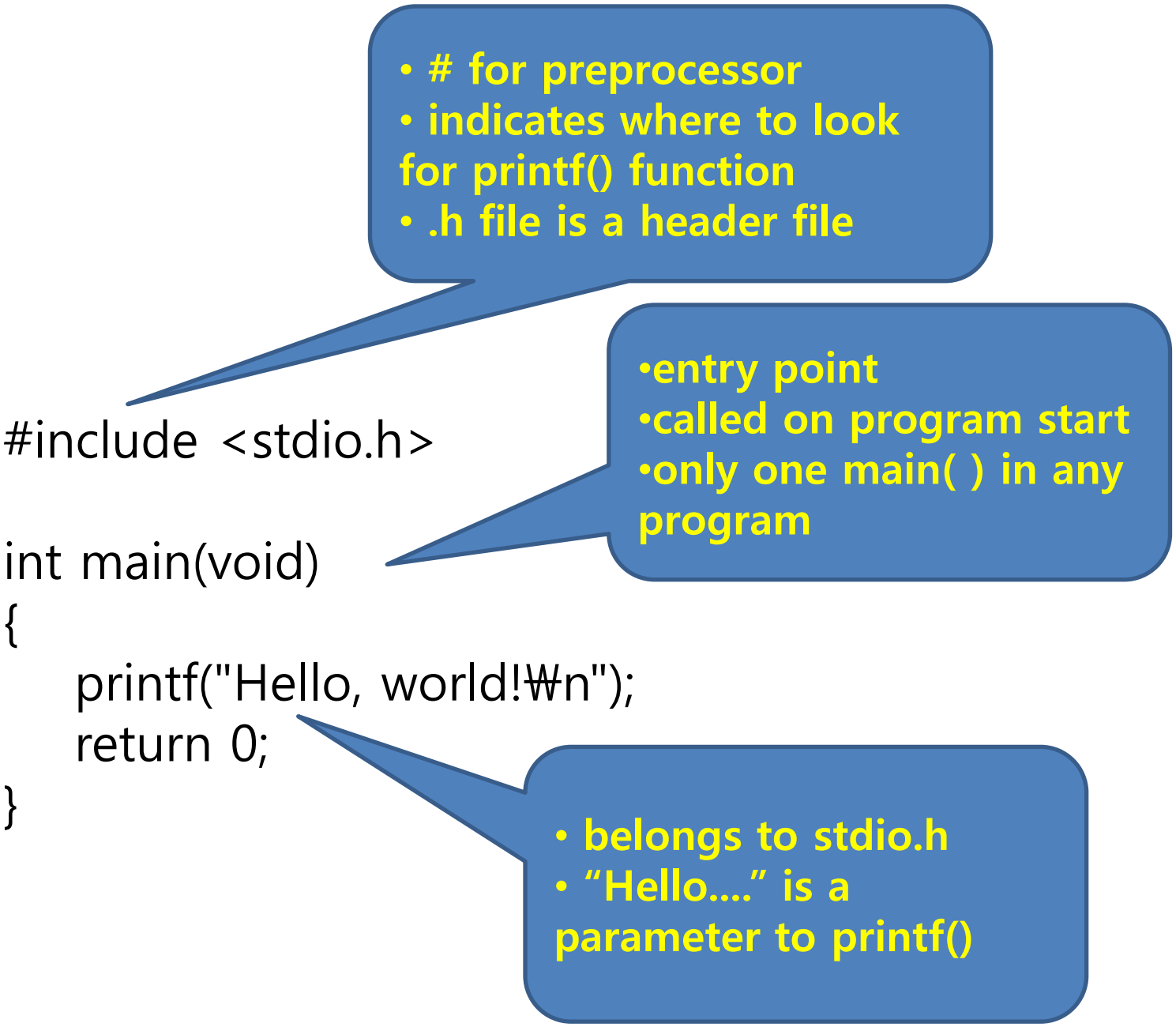
All you have to know about Computer for C programming 3

An Introduction to C

- 1972: developed by Dennis Ritchie
  - to develop an OS(Unix) for PDP-11
  - small
  - efficient
- 1989: ANSI C
  - portable
- Java is slow
  - JVM, instead of CPU, runs bytecode
  - string, vector, class, ...

C, C++, Java

- Java is safe and elegant, but slow
- C++ is unsafe and fast, also complex
- C is unsafe, but fast and simple
  - a small language (not many features)
  - portable
  - modular
  - basis for C++ and Java


• # for preprocessor
• indicates where to look for printf() function
• .h file is a header file
•entry point
•called on program start
•only one main( ) in any program
#include <stdio.h>
int main(void)
{
printf("Hello, world!₩n");
return 0;
}
• belongs to stdio.h
• “Hello….” is a parameter to printf()

Marathon Distance Program

- convert the distance to kilometers
  - 1 mile = 1.609 km = 1760 yards
  - we know that the marathon length is 26 miles and 385 yards, then what is it in kilometers?
    - the answer is 42.185968

```
/* The distance of a marathon in kilometers. */

#include <stdio.h>

int main(void)
{
    int      miles, yards;
    float    kilometers;

    miles = 26;
    yards = 385;
    kilometers = 1.609 * (miles + yards / 1760.0);
    printf("₩nA marathon is %f kilometers.₩n₩n", kilometers);
    return 0;
}
```

comment

declaration of variables

assignment

expression

Preprocessor

- performs before compilation
- # indicates that this line is a directive

- #define for symbolic constants

```
#define   PI    3.141592
#define   YARDS_PER_MILE          1760
```

- #include <file-name> imports a header file from some where
- #include “file-name” from your directory

```
#include <stdio.h>

#define    AREA                          2337
#define    SQ_MILES_PER_SQ_KILOMETER
0.3861021585424458
#define    SQ_FEET_PER_SQ_MILE           (5280 * 5280)
#define    SQ_INCHES_PER_SQ_FOOT          144
#define    ACRES_PER_SQ_MILE             640
```

pacific_sea.h

```
/* Measuring the Pacific Sea. */

#include "pacific_sea.h"

int main(void)
{
   const int    pacific_sea = AREA;      /* in sq kilometers */
   double       acres, sq_miles, sq_feet, sq_inches;

   printf("₩nThe Pacific Sea covers an area");
   printf(" of %d square kilometers.₩n", pacific_sea);
```

pacific_sea.c

I/O Using stdio.h

- printf(“any string or characters %d %f”, a, b);
  - “ “ indicates a format to be displayed
  - % is followed by a single character for a format
    - c (char), d (decimal), e (exponential), f(floating), s (string)
  - escape with ₩
    - ₩n, ₩t, ₩”, ₩₩
- scanf(“%d”, &age);
  - takes something from the standard input, and interpret as a decimal

```
#include <stdio.h>

int main(void)
{
    char      c1, c2, c3;
    int       i;
    float     x;
    double    y;

    printf("₩n%s₩n%s",    "Input three characters,"
              "an int, a float, and a double:  ");

    scanf("%c%c%c%d%f%lf", &c1, &c2, &c3, &i, &x, &y);

    printf("₩nHere is the data that you typed in:₩n");
    printf("%3c%3c%3c%5d%17e%17e₩n₩n", c1, c2, c3, i, x, y);
    return 0;
}
```

Control Flow

- each statement is executed one by one sequentially

- special statements change the flow
  - if (expr) a single statement OR { statements }
  - while (expr) a single statement OR
  - for (expr1; expr2; expr3) a single statement OR

```
expr1;
while (expr2)  {
   statement
   expr3;
}
```

```c
#include <stdio.h>

int main(void)
{
    int    i = 1, sum = 0;

    while (i <= 5) {
        sum += i;
        ++i;
    }
    printf("sum = %d₩n", sum);
    return 0;
}
```

Arrays

- deal with multiple same type data
- int xxx[3];
  - declares 3 integers; xxx[0], xxx[1], xxx[2]

```
int i;
i = 2;
xxx[i] = xxx[0] + 79;
```

- a string “abc”

Pointer

- address is a location in the imaginary space
  - an array name

```
int age[100];
```

```
char *p;
int *pq;
```

Functions

- Can you write a program of 10,000 lines in a single file?
  - divide your whole code into many small chunks
  - some chunks may look similar
    - make them into a single one; how?
    - this is a function
- main() is a special function called by ….

```c
#include <stdio.h>

float   maximum(float x, float y);
float   minimum(float x, float y);
void    prn_info(void);

int main(void)
{
    int      i, n;
    float    max, min, x;

    prn_info();
    printf("Input n:  ");
    scanf("%d", &n);
    printf("₩nInput %d numbers:", n);
    scanf("%f", &x);
    max = min = x;
    for (i = 2; i <= n; ++i) {
        scanf("%f", &x);
        max = maximum(max, x);
        min = minimum(min, x);
    }
}
```

```c
float maximum(float x, float y)
{
    if (x > y)
        return x;
    else
        return y;
}

float minimum(float x, float y)
{
    if (x < y)
        return x;
    else
        return y;
}

void prn_info(void)
{
    printf("₩n%s₩n%s₩n₩n",
        "This program reads an integer value for n, and then",
        "processes n real numbers to find max and min values.");
}
```

```
#include <stdio.h>

int main(void)
{
   int     a = 1;
   void    try_to_change_it(int);

   printf("%d₩n", a);      /* 1 is printed */
   try_to_change_it(a);
   printf("%d₩n", a);      /* 1 is printed again! */
   return 0;
}

void try_to_change_it(int a)
{
   a = 777;
}
```

Files

- you need files, believe me.
- xfp = fopen(“file-name”, “r”);
  - checks if the file is available
  - prepares a pointer, xfp, to a location inside a file
- now read from (write to) the file using the pointer

```
c = getc(xfp);
n = fscanf, “%d %d %f %s”, i, j, x, name);
```

```
/* Count uppercase letters in a file. */

#include <stdio.h>
#include <stdlib.h>

int main(int argc, char *argv[])
{
    int     c, i, letter[26];
    FILE    *ifp, *ofp;

    ifp = fopen(argv[1], "r");
    ofp = fopen(argv[2], "w");
    for (i = 0; i < 26; ++i)        /* initialize array to zero */
        letter[i] = 0;
    while ((c = getc(ifp)) != EOF)
        if (c >= 'A' && c <= 'Z')      /* find uppercase letters */
            ++letter[c - 'A'];
    for (i = 0; i < 26; ++i) {                  /* print results */
        if (i % 6 == 0)
            putc('₩n', ofp);
        fprintf(ofp, "%c:%5d      ", 'A' + i, letter[i]);
    }
    putc('₩n', ofp);
    return 0;
}
```