Lesson 8
Loops

Trịnh Thành Trung

trungtt@soict.hust.edu.vn

Topic of this week

- Loops
  - Class Lecture Review
    + The While,do Repetition Structure
    + Notes and Observations
    + Continue and break
  - Programming Exercises

The while,do Repetition Structure

- `while` Statement
  - The expression is evaluated. If it is true, statement is executed and expression is reevaluated. This cycle continues until expression becomes false.

```
while (expression)
{
    Statement1;
    Statement2;
     ...
}
```

The while,do Repetition Structure

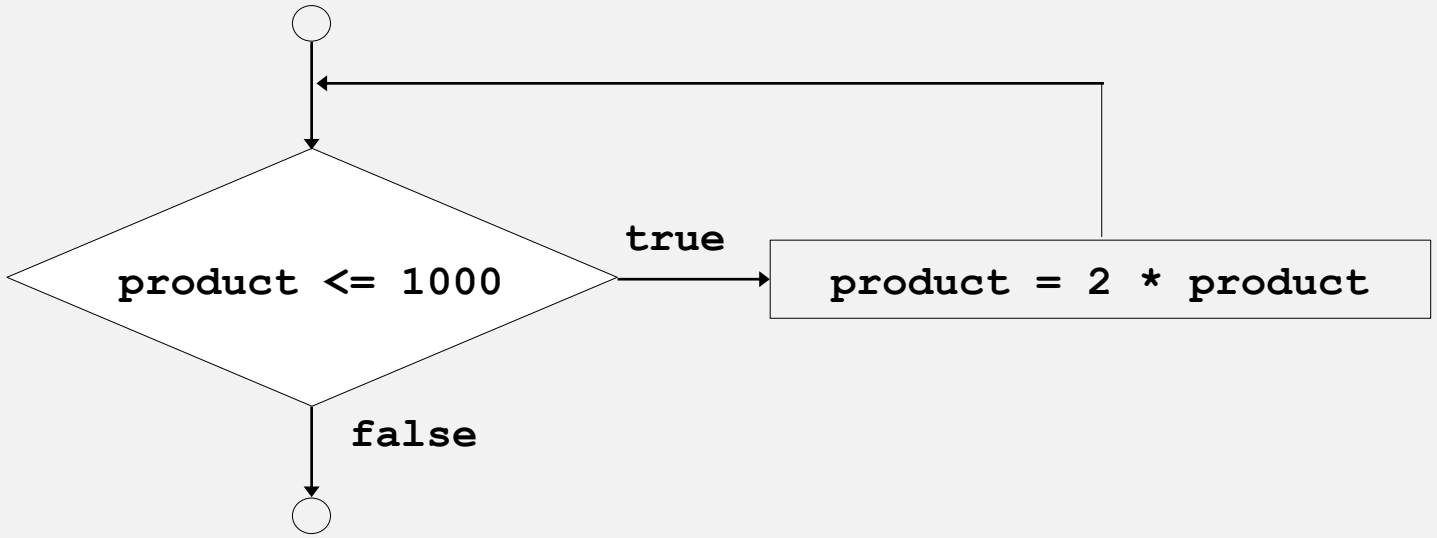
- Example of `while`

```
#include <stdio.h>
#define PERIOD '.'
main()
{
    char C;
    while ((C = getchar())!= PERIOD)
        putchar(C);
    printf("Good Bye.\n");
}
```

The while,do Repetition Structure

- Example:

```
int product = 2;
while ( product <= 1000 )
    product = 2 * product;
```



The while,do Repetition Structure

- Do-While Statement
  - The do-while, tests at the bottom after making each pass through the loop body; the body is always executed at least once.

```
do {
   statement1;
   statement2;
   …
} while (expression);
```

The while,do Repetition Structure

- Example of Do-While

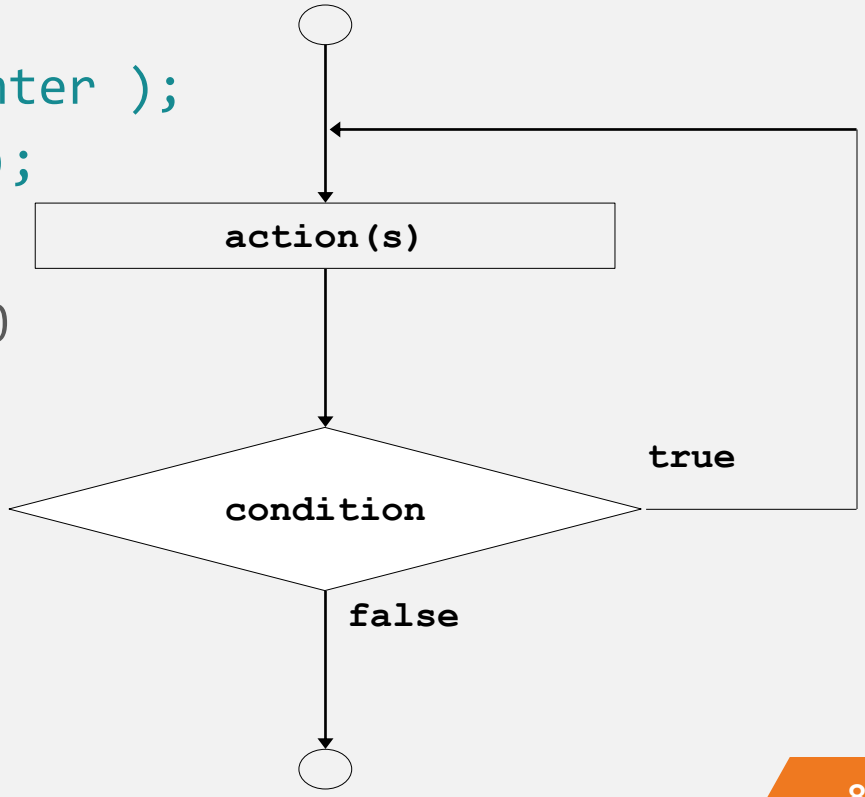
```
int i = 1, sum = 0;
do {
    sum += i;
    i++;
} while (i <= 50);
printf("The sum of 1 to 50 is %d\n", sum);
```

The while,do Repetition Structure

- Example (letting **`counter = 1`**)

```
do {
      printf( "%d  ", counter );
} while (++counter <= 10);
```

Prints the integers from 1 to 10



Continue and Break

- Break and Continue Statement
  - The break statement provides an early exit from for, while, and do.

```
break;
```

  - The continue statement is related to break, but less often used; it causes the next iteration of the enclosing for, while, or do loop to begin.

```
continue;
```

Continue and Break

- Example of Break and Continue

```
int c;
while ((c = getchar()) != -1) {
    if (C == '.')
     break;
    else if (c >= '0' && c <= '9')
     continue;
    else putchar(c);
}
printf("*** Good Bye ***\n");
```

Create Menu interaction using While/Do while – switch case

```
char ch; /* int c */
do {
  /* code block to print out menu */
  ch = getchar(); /* scanf(%d, &c) */
  switch (ch) {
    case : 'A'
        /* do some thing */ break;
    case : 'B'
        /* do some thing */ break;

     ….
    case: 'Q'
        Print Quit; break;
}
while (ch!='Q');
```

input validation using do while

```
do
{
    printf("input n:");
    scanf(&n);
    if (n is not valid)
        printf ("Warning\n");
}
while (n is not valid)
```

Programming Menu

```
do {
    printf Menu 1 2 3 4.. your selection:
    scanf("%d", &choice);
    switch (choice)
        case 1:  do smt ; break
        case 2: do smt; break
        case n: do smt; break
        default: warning input not valid;
                 break
} (choice != selection to quit);
```

How to clear newline character from the buffer

```
while (getchar()!='\n');
```

Exercise 8.1

- Write a program that copies content inputed from the keyboard to the screen, but replace the sequence of blank characters by only one blank character.
- You can use getchar() and putchar() method to carry out this program.

Exercise 8.2

- Write a program that replaces characters such as: tab,\t,\b by \\ character in the input string and print out.
- You can use getchar() method to carry out this program.
- You can use if structure or switch structure.

Exercise 8.3

- Calculate square root by using newton method.

$x_o = n$

$x_{k+1} = (x_k + n/ x_k)/2$

Exercise 8.4

- How to compute the payroll for a company?
- Write and compile the program below to see how you can use while statement to do this task.

exercise8_4.c

```
#include <stdio.h>

int
main(void)
{
      double total_pay;    /* company payroll     */
      int    count_emp;    /* current employee    */
      int    number_emp;   /* number of employees */
      double hours;        /* hours worked        */
      double rate;         /* hourly rate         */
      double pay;          /* pay for this period */
      /* Get number of employees.                 */
      printf("Enter number of employees> ");
      scanf("%d", &number_emp);
```

```
    /* Compute each employee's pay and
       add it to the payroll. */
    total_pay = 0.0;
    count_emp = 0;
    while (count_emp < number_emp) {
        printf("Hours> ");
        scanf("%lf", &hours);
        printf("Rate > $");
        scanf("%lf", &rate);
        pay = hours * rate;
        printf("Pay is $%6.2f\n\n", pay);
        total_pay = total_pay + pay;
        count_emp = count_emp + 1;
    }
    printf("All employees processed\n");
    printf("Total payroll is $%8.2f\n", total_pay);
    return (0);
}
```

Exercise 8.5

- Write a program that use *while* structure to analysis of examination results: how many passed students and failed students.
- You can simply ask user to show that a student is passed or failed by entering a presented number: 1 is passed and 2 is failed.

Exercise 8.6

- Use do...while statement to print out integers that is smaller than a preceded number.
- Note that the do...while statement always performs one time at least.

Exercise 8.7

- We would like a program to average a set of grades.
- Algorithm notes:
  - We need a running sum of grades, and a running count of how many grades have been read so far.
  - We need to read until we get a sentinel value | let's use a negative grade to indicate we are done.
  - Need to be sure we print prompts.

Exercise 8.8

- Write a program that compute n! using a loop.
- You can use:
  - Counter" variable, i, ranging from 1 to n.
  - Running product f, tracking i!.