Programming Fundamentals (COMP1112)
Lecture 4
Selection Structure

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Selection structure- a type of control structure

- Programs may not be limited to a linear sequence of statements.
- Selection statements take decisions and bifurcate the program.
- Types of selection structure include
  - if
  - if/else
  - switch

if statement

- if keyword is used to execute a statement or block

Syntax:

if (condition) statement

Here, condition is the expression that is being evaluated.
If this condition is true, statement is executed. If it is false, statement is not executed (it is simply ignored), and the program continues right after the entire selection statement.

Example:

```
int x=60;
 if (x == 50)
cout << "x is 50“;
```

if statement (cont..)

- To include more than a single statement to be executed when the condition is fulfilled, these statements shall be enclosed in braces ({}), forming a block

Example:

```
if (x == 100)
{
cout << "x is ";
cout << x;
}
```

- Limitation of if statement

What will happen when condition is false?

if/else structure

- Selection statements with if can also specify what happens when the condition is not fulfilled, by using the else keyword to introduce an alternative statement. Syntax:

if (condition) statement1 else statement2

where statement1 is executed in case condition is true, and in case it is not, statement2 is executed.

if/else structure (cont..)

- Example 1:

```
int x=90;
if (x == 100)
cout << "x is 100"; //1
else
cout << "x is not 100";//2
```

Note: This prints x is not 100.

Multiple if/else structure

- Example 2:

```
int x=-1;
if (x > 0)
cout << "x is positive";
else if (x < 0)
cout << "x is negative";
else cout << "x is 0";
```

This prints whether x is positive, negative, or zero by concatenating two if-else structures. Again, it would have also been possible to execute more than a single statement per case by grouping them into blocks enclosed in braces: {}.

Nested ‘if’ structure

- If within if
- Control enters in inner if when the outer if condition is true
- User can use as many if statements inside another if as required

Syntax:

```
if(condition)
        if(condition) {}
        else {}
else
{}
```

Example: A Program that inputs three numbers and displays whether all numbers are equal or not using nested if

```
int a,b,c;
cout<<"Enter the values of a, b and c";
cin>>a>>b>>c;
if( a==b)
if (a==c)
cout<<"\n All numbers are equal";
else
cout<<"\n Numbers are different";
else
cout<<"\n Numbers are different";
```

Compound condition

- A type of condition in which more than one conditions are checked.
- Implemented using logical operators &&, ||, !

Example:

```
char grade;
cin>>grade;
if(grade==‘A’ || grade==‘a’)
```

Switch statement

- The switch statement executes one or more of a series of cases, based on the value of a controlling expression.

Syntax:

switch (expression)

statement

The Switch statement is typically a compound statement, within which are one or more case statements executed if the control expression matches the case.

Switch statement (cont..)

The syntax for a case label and expression follows:

case constant-expression :
statement

- The constant expression must have an integral type
- No two case labels can specify the same value
- There is no limit on the number of case labels in a switch statement
- Only one statement in the compound statement can have the following label

default:

Switch statement (cont..) -Sequence of control

When the switch statement is executed, the following sequence takes place:

- The switch control expression is evaluated (and integral promotions applied) and compared with the constant expressions in the case labels.
- If the control expression's value matches a case label, control transfers to the statement following that label. If a break statement is encountered, the switch statement terminates; otherwise, execution continues into the following case or default statements until a break statement or the end of the switch statement is encountered
- If the control expression's value does not match any case label, and there is a default label, control is transferred to the statement following that label. If a break statement does not end the default statement, and a case label follows, that case statement is executed.
- If the control expression's value does not match any case label and there is no default label, execution of the switch statement terminates.

Complete Syntax: switch statement

```
switch(expression) {
   case constant-expression  :
      statement(s);
      break;
  case constant-expression  :
      statement(s);
      break;
  default :
     statement(s);
}
```

Program 1 – selection statement (cont..)

```
int day =4;
switch (day) {
  case 1:
    cout << "Monday";
    break;
  case 2:
    cout << "Tuesday";
    break;
  case 3:
    cout << "Wednesday";
    break;
  case 4:
    cout << "Thursday";
    break;
```

Program 1 – selection statement

```
case 5:
    cout << "Friday";
    break;
  case 6:
    cout << "Saturday";
    break;
  case 7:
    cout << "Sunday";
    break;
default:
cout<<“inappropriate value”;

}
```

Program 2 – Selection statement

```
int time = 22;
if (time < 10) {
  cout << "Good morning.";
} else if (time < 20) {
  cout << "Good day.";
} else {
  cout << "Good evening.";
}
```

Program 3 – Selection statement

```
int day = 4;
switch (day) {
  case 6:
    cout << "Today is Saturday";
    break;
  case 7:
    cout << "Today is Sunday";
    break;
  default:
    cout << "Looking forward to the Weekend";
}
// Outputs "Looking forward to the Weekend"
```

Class exercise

- Write a C++ program that takes a student grade as an input and displays that grade. The grade is valid if it is A, B, C, D or F. Incase of an invalid grade input, the program should display appropriate message.

References

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