

# C++ Conditions, Loops, and Control Statements in Game Development

## Conditions:

In C++, conditions are used to make decisions based on certain criteria. The following are examples of conditions commonly used in game development:

### if:

The if statement is used to execute a block of code if a certain condition is met. For example:

```
if (health <= 0) {  
    gameOver();  
}
```

This code checks if the player's health is less than or equal to 0, and if so, calls the function `gameOver()`.

### else if:

The else if statement allows you to test multiple conditions. For example:

```
if (health <= 0) {  
    gameOver();  
} else if (health <= 50) {  
    playSound("warning.wav");  
}
```

This code checks if the player's health is less than or equal to 0, and if so, calls the function `gameOver()`. If the player's health is not less than or equal to 0, it checks if their health is less than or equal to 50, and if so, plays a warning sound.

### Short Hand If Else:

The short hand if else statement allows you to write an if statement on one line. For example:

```
gameOver = (health <= 0) ? true : false;
```

This code checks if the player's health is less than or equal to 0, and if so, sets the variable `gameOver` to true, otherwise it sets it to false.

## Switch:

The switch statement is used to execute different blocks of code depending on the value of a variable. For example:

```
switch (direction) {  
    case left:  
        moveLeft();  
        break;  
    case right:  
        moveRight();  
        break;  
    case up:  
        moveUp();  
        break;  
    case down:  
        moveDown();  
        break;  
    default:  
        break;  
}
```

This code checks the value of the variable `direction`, and depending on its value, calls a different function.

## Loops:

Loops are used to repeat a block of code multiple times. The following are examples of loops commonly used in game development:

### While Loop:

The while loop is used to repeat a block of code while a certain condition is true. For example:

```
while (playerIsAlive) {  
    update();  
    draw();  
}
```

This code repeats the functions `update()` and `draw()` while the variable `playerIsAlive` is true.

### Do-While Loop:

The do-while loop is similar to the while loop, but it executes the block of code at least once before checking the condition. For example:

```
do {  
    update();  
    draw();  
} while (playerIsAlive);
```

This code is similar to the previous example, but it will always execute the functions `update()` and `draw()` at least once, even if the variable `playerIsAlive` is initially `false`.

## For Loop:

The `for` loop is used to repeat a block of code a fixed number of times. For example:

```
for (int i = 0; i < numEnemies; i++) {  
    spawnEnemy();  
}
```

This code spawns a certain number of enemies, determined by the variable `numEnemies`.

## Continue and Break:

The `continue` and `break` statements are used to control the flow of loops. The following are examples of how these statements can be used in game development:

### Continue:

The `continue` statement is used to skip to the next iteration of a loop. For example:

```
for (int i = 0; i < numEnemies; i++) {  
    if (enemyList[i].isAlive()) {  
        continue;  
    }  
    spawnEnemy();  
}
```

This code checks if the enemy is alive, and if so, skips to the next iteration of the loop. If the enemy is not alive, it spawns a new one.

### Break:

The `break` statement is used to exit a loop. For example:

```
for (int i = 0; i < numEnemies; i++) {  
    if (!enemyList[i].isAlive()) {  
        break;  
    }  
    updateEnemy(enemyList[i]);  
}
```

This code updates each enemy in the list, but stops updating if it encounters an enemy that is not alive.

Functions:

Functions are used to organize code into reusable blocks. The following are examples of functions commonly used in game development:

```
void update() {  
    // Update game state  
}
```

This function updates the game state, and can be called at any time during the game loop.

```
void draw() {  
    // Draw graphics  
}
```

This function draws the graphics for the game, and can also be called at any time during the game loop.

```
int random(int min, int max) {  
    // Generate a random number between min and max  
}
```

This function generates a random number between a minimum and maximum value, which is useful for things like enemy spawn locations or loot drops.

Common g++ commands for compiling, linking, and running C++ code:

### 1. Compiling C++ Code:

To compile a C++ source file (e.g., `example.cpp`) into an object file (e.g., `example.o`):

```
g++ -c example.cpp -o example.o
```

This command compiles the source file `example.cpp` into an object file named `example.o`.

### 2. Linking Object Files:

To link one or more object files (e.g., `example.o`) into an executable (e.g., `example`):

```
g++ example.o -o example
```

This command links the object file(s) into an executable named `example`.

### 3. Running Executable:

To run the compiled executable:

```
./example
```

This command executes the compiled executable named `example`.

Here's a summary:

- **g++**: This is the GNU Compiler Collection for compiling C++ programs.
- **-c**: This option tells `g++` to compile the source file(s) into object file(s) without linking.
- **-o**: This option specifies the output file name.
- **./**: This notation is used to execute the compiled executable from the current directory.

You can adjust the filenames (`example.cpp`, `example.o`, `example`) according to your actual source code file(s) and desired executable name.

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16  
17 impl Network <'>{  
18  
19 pub fn new\_net<'a>(layers: Vec<usize>, learning\_rate: f64 , activation: Activation<'a>) -> Network {  
20 let mut weights: Vec<Matrix> = vec![];  
21 let mut biases: Vec<Matrix> = vec![];  
22  
23  
24 use in 0..layers.len() - 1 {  
25 weights.push(Matrix::random\_fnc(rows: layers[i+1], cols: layers[i]));  
26 biases.push(Matrix::random\_fnc(rows: layers[i+1], cols: 1));  
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