Types Of Errors In C++ Programming (06 Feb, 2025)

Introduction

Errors in C++ programming, Aah! I guess every programmer faces them. But, There are some types of errors in programming, and understanding different types of errors might help in debugging and improving code efficiency.

In C++, errors can be classified into three main types:

1. **Syntax Errors** (Compile-Time Errors)
2. **Logical Errors**
3. **Runtime Errors (Exceptions)**

We'll go through each of them one by one!

1. Syntax Errors (Compile-Time Errors)

A **syntax error** occurs when the code does not follow the rules of the C++ language. These errors are detected by the compiler before the program runs

```cpp
#include <iostream>
using namespace std;
int main() {
    cout << "Hello, World!"  // Missing semicolon
    return 0;
}
```

Error: expected ';' before 'return'
Fix: Add a semicolon at the end of the cout statement.

2. Logical Errors

A **logical error** happens when the program runs but produces incorrect results. These errors do not generate compiler warnings, making them harder to detect.

```
#include <iostream>
using namespace std;

int main() {
    int num1 = 5, num2 = 10;
    int sum = num1 - num2;  // ⚠Wrong operator used (should be +)

    cout << "Sum: " << sum << endl;  // Output: Sum: -5 (Incorrect)
    return 0;
}
```

Error: The program runs successfully but gives an incorrect result.
Fix: Change num1 - num2 to num1 + num2.

3. Runtime Errors (Exceptions)

A **runtime error** occurs during program execution. These errors can cause the program to crash

```
#include <iostream>
using namespace std;

int main() {
    int a = 10, b = 0;
    cout << "Result: " << (a / b);  // ⚠ Division by zero
    return 0;
}
```

Error: Floating-point exception (crash).
Fix: Check for zero before performing division.

Example 2: Out-of-Bounds Array Access

```cpp
#include <iostream>
using namespace std;

int main() {
    int arr[3] = {1, 2, 3};
    cout << arr[5];  // ⚠ Accessing an invalid index
    return 0;
}
```

Error: Undefined behavior, might crash or give garbage value.

Fix: Ensure the index is within array bounds

Other Types of Errors

4. Semantic Errors

Semantic errors occur when the code is logically correct but does not do what was intended.

```cpp
#include <iostream>
using namespace std;

int main() {
    int x = 5;
    cout << "Double of x is: " << x * x << endl;  // Should be x * 2
    return 0;
}
```

Error: The code compiles, but the logic is wrong.

Fix: cout << "Double of x is: " << x * 2 << endl;

5. Linker Errors

Linker errors occur when the compiler cannot link referenced functions or libraries.

```cpp
#include <iostream>
using namespace std;

void show();  // Function declared but not defined

int main() {
    show();  // Linker error: Undefined reference to 'show'
    return 0;
}
```

A Simple encoded note for nerds, but with a good heart…

SSBqdXN0IHdhbm5hIGNvbnZlcnQgbXkgU1RSRVNTIGludG8gUFJPRFVDVElWSVRZLCBTbyBJIG1hZGUgdGhpcywgTUFZQkU=

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