IIT Bombay

Computer Programming

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Session: Conditional Execution in C++ Programs - Part A

Quick Recap of Some Relevant Topics

- Structure of a simple C++ program
- Variables and type declarations
- Assignment statements
- Arithmetic and logical expressions
- Sequential execution of statements

Overview of This Lecture

- Conditional execution of statements in C++

  "if … else …" statement and its variants

Recalling Some Useful Facts

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- Program: sequence of compiler directives, declarations, instructions
- Normally, computer (Mr. Dumbo) executes instructions
  - In same order in which they appear in program
  - top to bottom, left to right, separated by “;”

A Simple Problem

- Consider the problem:

  Divide integer A by integer B and output the quotient Q.

- Sounds simple!

  Do we really want to divide if B is 0?

```
int main() {
   int A, B, Q;
   cout << “Give A and B” << endl;
   cin >> A >>  B;
   Q = A/B;
   cout << “Quotient is: “ << Q << endl;
   return 0;
}
```

A Simple Problem

- Consider the problem:

  Divide integer A by integer B and output the quotient Q if B is non-zero. Otherwise, output the string ”Bad inputs!”

- We need conditional execution of (blocks of) instructions
  - Read inputs A and B — Unconditionally execute first
  - Divide A by B and output quotient Q — Execute next only if B is non-0
  - Output the string “Bad inputs!” — Execute next only if B is 0
  - Return control to caller/OS — Unconditionally execute last

A Simple Problem

- Consider the problem:

  Divide integer A by integer B and output the quotient Q if B is non-zero. Otherwise, output the string ”Bad inputs!”

- If B is non-zero, sequence of execution:
  - Read inputs A and B — Unconditionally execute first
  - Divide A by B and output quotient Q — Execute next since B is non-0
  - Return control to caller/OS — Unconditionally execute last

A Simple Problem

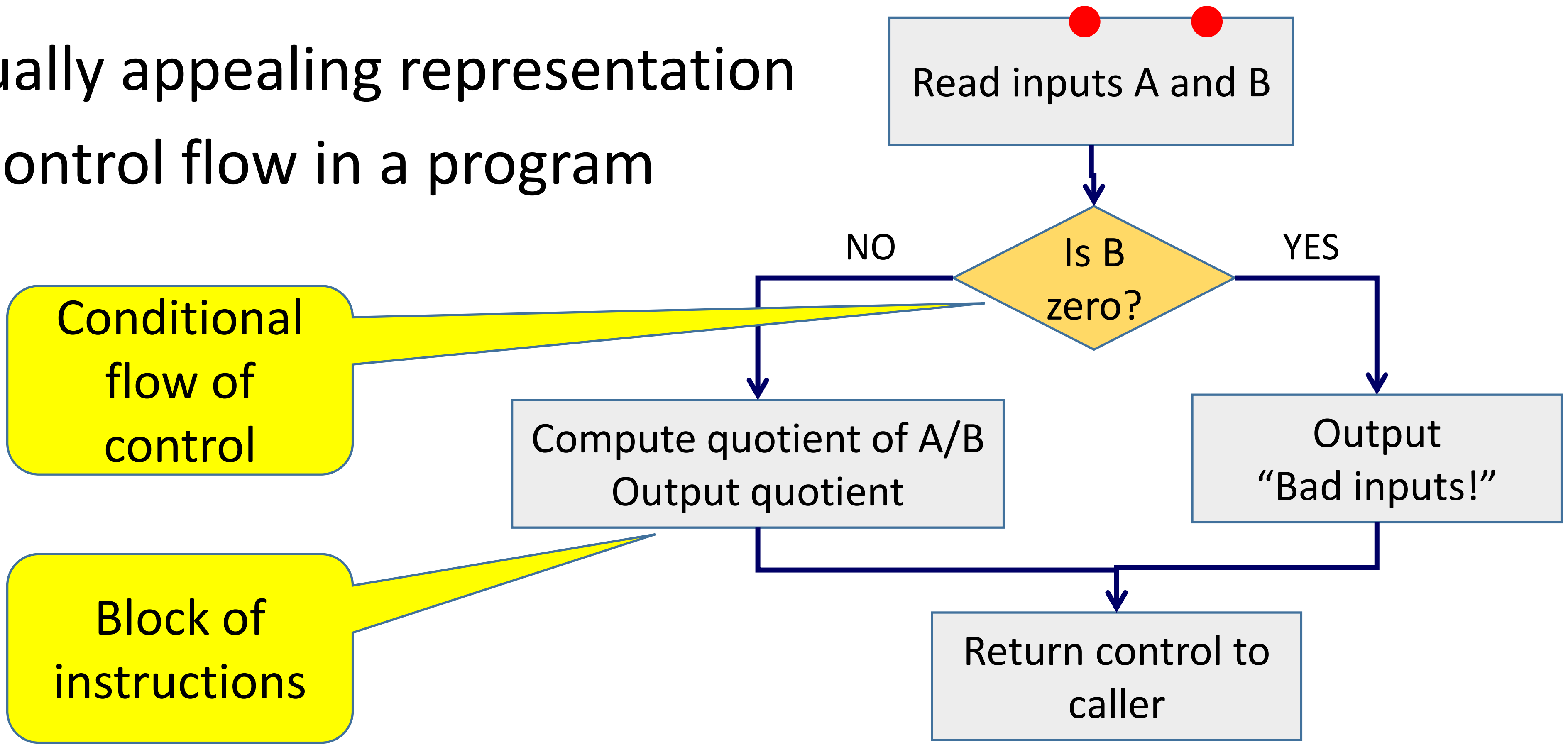
- Consider the problem:

  Divide integer A by integer B and output the quotient Q if B is non-zero. Otherwise, output the string ”Bad inputs!”

- If B is zero, sequence of execution:
  - Read inputs A and B — Unconditionally execute first
  - Output the string “Bad inputs!” — Execute next since B is 0
  - Return control to caller/OS — Unconditionally execute last

Flowchart Representation

- Visually appealing representation of control flow in a program



Flowchart Representation

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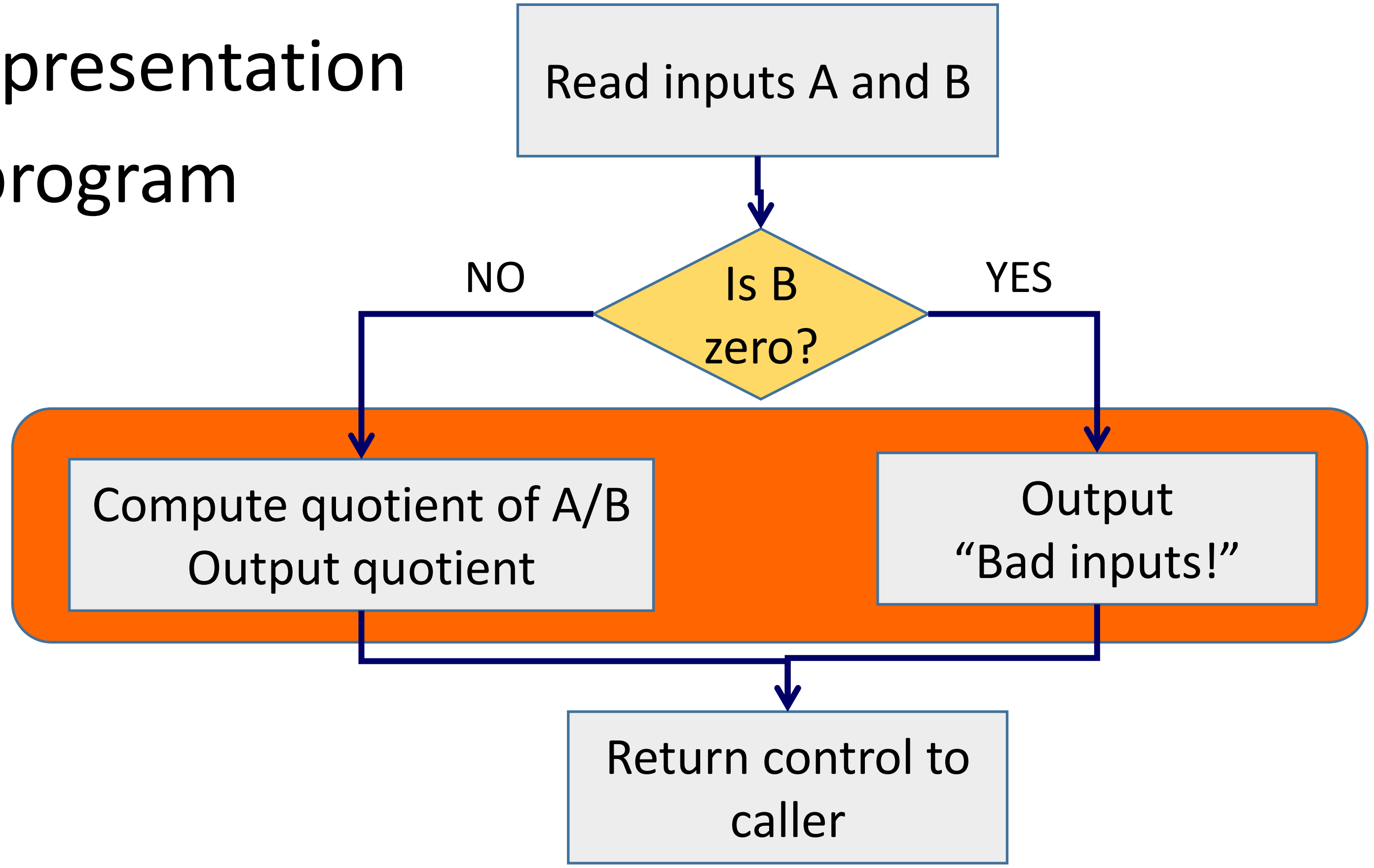
- Visually appealing representation of control flow in a program

Control can only flow through one block, not both



Conditional Execution in C++

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- **"if … else …"** statement

```
if (B == 0)  {
        cout << "Bad inputs!" << endl;
}
else {
        quotient = A/B;
        cout << "Quotient is: " << quotient << endl;
}
```

Keywords of C++

Conditional Execution in C++

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- **"if … else …"** statement

```
    if (B == 0)  {
        cout << "Bad inputs!" << endl;
    }
    else {
        quotient = A/B;
        cout << "Quotient is: " << quotient << endl;
    }
```

Logical expression:
Evaluates to true/false

Conditional Execution in C++

- **"if … else …"** statement

```
if (B == 0) {
        cout << "Bad inputs!" << endl;
}
else {
        quotient = A/B;
        cout << "Quotient is: " << quotient << endl;
}
```

Block of statements:
Grouped by { … }

Another block

Blocks in an “if … else … “ Statement

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- Blocks can be any sequence of C++ statements
- Specifically, can be another “if … else …” statement

```
if (B == 0) {
     cout << “Bad input!” << endl;
}
else {
     if (B == 1) { cout << “Are you joking?” << endl; }
     else { quotient = A/B; cout << “Quotient is: “ << quotient << endl;}
}
```

- Arbitrary nesting of “if … else … “ statements allowed in C++

"if …" Without "else …"

- "else …" is optional in C++

  if (B == 0) { …   }   equivalent to

  if (B == 0) { …   } else { // Do Nothing }

- Succinct way to write programs when nothing needs to be done in "else" branch

"if … else …" Statements and { … }

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- Calls for caution

```
if (B == 0)
    cout << “Hello “;
    cout << “world!!!“ << endl;
```

Unconditionally executed

Output if B is 0: “Hello world!!!”

Output if B is not 0: “world!!!”

"if … else …" Statements With Other Statements

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- "if … else …" statement (or "if … " statement) can be sequenced with other statements
  - Similar to assignment and input/output statements for sequencing purposes
  - Can have "return" statements in "if …" or "else …" blocks

A Program With Conditional Execution

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```
#include <iostream>
using namespace std;
// Program to compute quotient
int main() {
   int A, B, Q;  // Variable declarations
   cout << “Give A and B” << endl;
   cin >> A >>  B;
   if (B == 0) { cout << “Bad inputs!!!” << endl; return -1;}
   else { Q = A/B; cout << “Quotient is: “ << Q << endl; }
   cout << “Be happy!” << endl;
   return 0;
}
```

Summary

- Conditional execution of statements in C++ programs
  - "if … else …" statement and its usage
- Nesting of "if … else …" statements
- An example program with conditional execution