John Perry

What is C++

Hello C++

Compiling

Summary

MAT 685: C++ for Mathematicians C++: Basics

John Perry

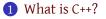
University of Southern Mississippi

Spring 2017

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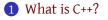


Outline

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Outline

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Kinds of computer languages

- Interpreted
 - BASIC, Python, Perl
 - computer reads source, repeats following:
 - translate symbols until full command formed

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- execute command
- no translation saved

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Kinds of computer languages

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 - C/C++, FORTRAN, Go
 - reads source, translates and saves **machine** code
 - translation works on same architecture (OS, CPU, ...)

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 - reads source, translates and saves **machine** code
 - translation works on same architecture (OS, CPU, ...)
- Mixed ("bytecode")
 - C#(.NET), Java
 - reads source, translate into bytecode, saves
 - translation works in "virtual machine" (JVM, .Net, ...)

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What sort of work will we do?

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C++ is

- compiled
- multi-paradigm
 - focus on object-oriented
- widespread
- difficult, but
- rewarding

Which C++

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What is C++?

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Summary

- C++ has several standards:
 - C++98 (book)
 - C++03
 - C++11 (class)
 - C++14

Which C++

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Surprisingly, C++11 feels like a new language: The pieces just fit together better than they used to and I find a higher-level style of programming more natural than before and as efficient as ever.

— Bjarne Strousroup, inventor of C++

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C++ does not feel pain. It can't be reasoned with. Starting a fight is a big mistake. If you want to use C++, you must learn to love it the way it is... — C++ FQA

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What is C++?

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Which C++ compiler?

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- GCC: GNU Compiler Compilation
 - Gnu's Not Unix
 - industry standard, multi-platform
 - many languages: Ada, C, C++, Fortran, Go, Java, Objective-C, Objective-C++

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 - multi-platform, closely tied to Apple, weak on Windows (2017)
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 - extension to use GCC's languages ("dragonegg")

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- Visual Studio
 - Microsoft, claims to be multi-platform
 - certain languages: C, C++, F#, Python
 - IDE: Integrated Development Environment

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What is C++
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Hello C++ Compiling Summary

Our version of "Hello, world"

Listing 1: poem.cpp

```
#include <iostream>
using std::cout; using std::endl;
/**
 * A simple program for demonstrating the basics
 * of a C++ project.
 *
 * It does a good job of demonstrating C++
 * fundamentals, but a terrible job with the poetry.
 */
int main() {
  cout << "Don't you just feel like a louse" << endl;</pre>
  cout << "To learn that your \"new\" theorem";
  cout << " was proved by Gauss?" << endl;
  return 0;
```

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Summary

Things to notice: setup

.cpp book uses .cc; can use .cc, .cpp, .cxx #include asks C++ to read another file using std::... tells C++ that any instance of ... comes from a namespace called std

- book uses different, discouraged approach
- typically add to beginning of each program

 $/ \star ... \star / ~$ comments, have no meaning to C++

- use / * ... * / for multi-line comments
- use / / ... for a one-line comment

...; statement terminator (at "statement" end)

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What is C++2

Hello C++ Compiling

Summary

Things to notice: general structure

int main() declares a function main()

• takes no arguments (nothing in parentheses)

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returns an integer

return 0 return the value 0 to calling program

• "0" convention for "no error"

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What is C++?

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Things to notice: communication

iostream "library" file for input and output on "streaming" devices

- can only go forwards, not backwards
- printing to a console, to a file, to a printer, ...

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- cout console output
 - << operation on cout and following text string
 - " quote to begin and end a text string
 - \" "escape" character to include quotation mark in text string
- endl end-of-line object

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What is C++? Hello C++ Compiling



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Compiling

Summary

Invoke the compiler

\$ g++ <options> <filename>

Invoke g++

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Summary

Invoke the compiler

\$ g++ <options> <filename>

Execute your program

<options> include an "object name"

\$ <object name>

• <options> do not include an "object name" (naughty!),

\$ a

(seriously)

Invoke g++

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Summary

Compiler options

-o name of executable, follow with <object
 name>

- -g include debug information
- -pg include profiling information
- -Ofast optimize for highest speed

-std=c++11 use the C++11 standard

Example

To create a debuggable executable my_poem from poem.cpp:

\$ g++ -o my_poem -g poem.cpp

To execute:

\$ my_poem

To debug it: (we talk about this later)

\$ gdb my_poem

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Basic debugger commands

b i create a breakpoint at line i
 (this allows you to stop the program at a line of interest)

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- $\ensuremath{\,\mathrm{n}}$ execute the next line in the program
- run let's get this party started
- until *i* execute until we reach line *i*
 - quit I hate to be a downer, but...

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Summary

- C++ is a compiled, multi-paradigm, object-oriented programming language
- Using C++11
- basic C++ features illustrated in poem.cxx

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Homework

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