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Department

Introduction to Computer Science I

Introduction to Programming

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What is Computer Science?

- ▶ A **computation** is a sequence of well-defined operations that lead from an initial starting point to a desired final outcome



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Computer science is the study of computation



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Computer science is the study of computation

- ▶ investigating problems that can be solved computationally



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- ▶ programming languages used to describe computations



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- ▶ programming languages used to describe computations
- ▶ machines that carry out computations



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- ▶ programming languages used to describe computations
- ▶ machines that carry out computations
- ▶ theoretical limits of computation (what is or is not computable)



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- ▶ **computational solutions to problems in math, science, medicine, business, education, journalism, ...**



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Computers play a key role



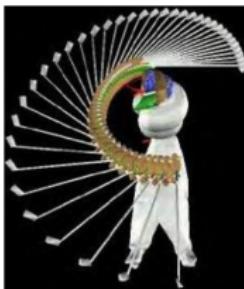
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Applications of Computer Science

Motion Analysis



Fastball and breaking ball
comparison analysis





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Applications of Computer Science

Animated Movies ...





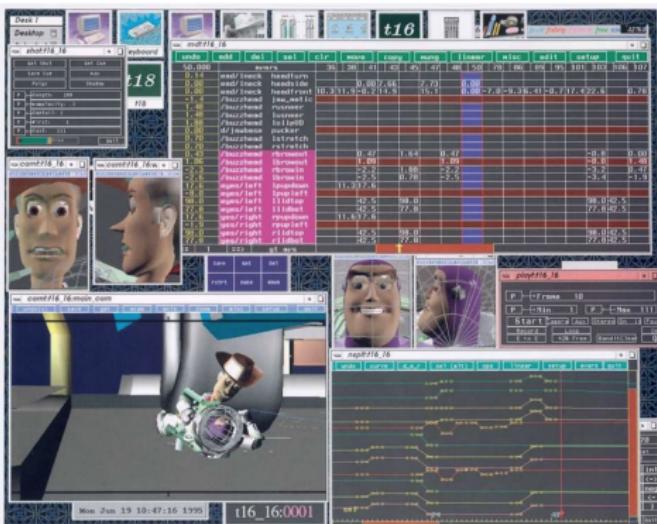
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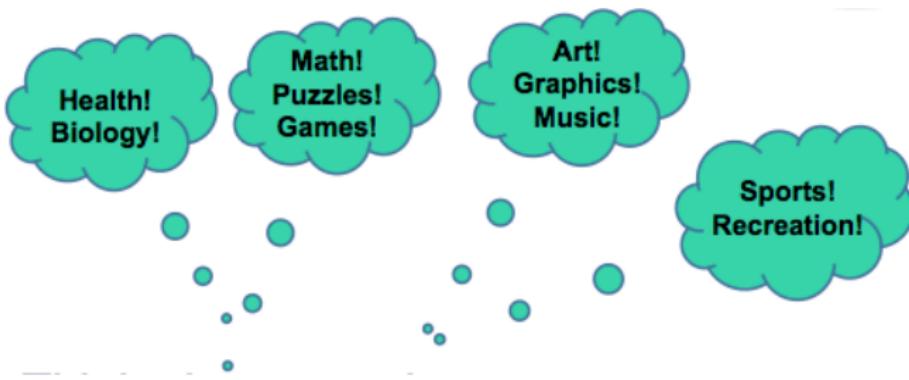
Applications of Computer Science

... are made by Computer Scientists





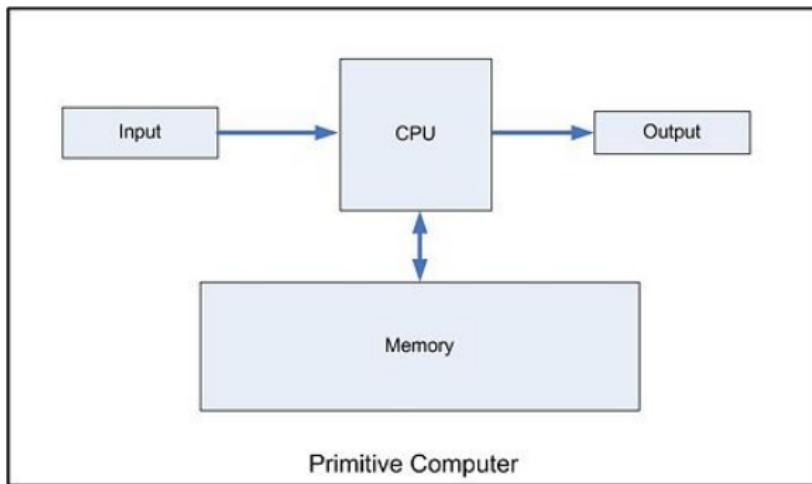
Applications of Computer Science



- ▶ Think about your interests ...
- ▶ You can bet computer scientists are working in these areas!



What is a computer?





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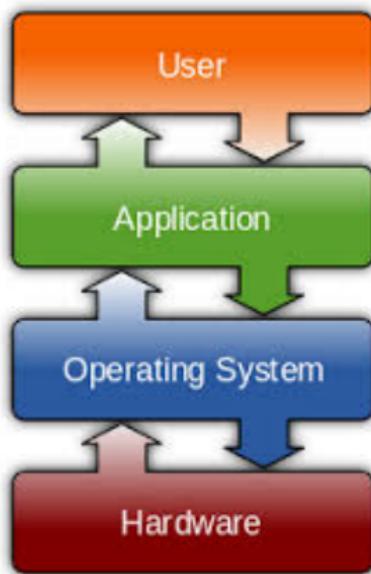
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Hardware/Software

- ▶ Software/hardware relationship:
 - ▶ Hardware is controlled by software
 - ▶ Software is the collection of instructions that you issue to the computer to perform actions and make decisions



Simple Structure





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What is Computer Programming?



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What is Computer Programming?

- ▶ Programming is the act of writing usable and useful software
- ▶ A program is a set of instructions



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Programming Language

- ▶ We will use **Java** programming language in this class
- ▶ Java is a programming language originally developed by Sun Microsystems and released in 1995 as a core component of Sun's Java platform



HISTORY OF JAVA

- ▶ Started development in 1991 at Sun
- ▶ Originally called Oak
- ▶ Intended for smart consumer-electronic devices
- ▶ Derives much syntax/concepts from C++
- ▶ BCPL → B → C → C++ → Java
- ▶ Development almost halted, but 1993 saw introduction of web; Java was revamped to be able to easily add dynamic content to web pages
- ▶ Formally announced and released in May 1995
- ▶ Released under GPL to the public in May 2007



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Programming in Java

- ▶ Java is an **object-oriented** programming language



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Programming in Java

- ▶ Java is an **object-oriented** programming language
- ▶ **Objects** are fundamental elements that make up a program



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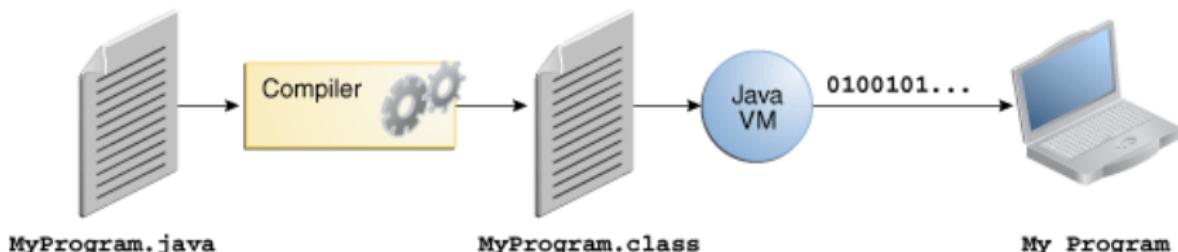
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Programming in Java

- ▶ Java is an **object-oriented** programming language
- ▶ **Objects** are fundamental elements that make up a program
- ▶ Java has a library of software, called **Java API**, that is available for your use



Java program development process





Simple first Java Program: “Hello World”

```
// This is the first program people write in a new language,
// the "Hello World!". In Java, this file must be named
// Welcome.java, with the first part of the name, Welcome, being
// the same as the name of the class. The filename itself
// (not the class name) must always end in .java to indicate
// to the operating system that it's a java source file.
public class Welcome
{
    public static void main ( String args[] )
    {
        System.out.println ( "Hello World!" );
    }
}
```



Comments

Comments in Java can be one of three styles:

- ▶ **Single line:** starts at // anywhere on a line, ends at the end of that line
- ▶ **Multi-line:** starts with character sequence /* anywhere, ends with character sequence */ anywhere after that can span multiple lines
- ▶ **javadoc:** starts with character sequence /** anywhere, ends with character sequence */ anywhere, after that uses javadoc utility to create HTML documentation from code



- ▶ public class Welcome:
 - ▶ **public** means that something is available across packages (reserved word)
 - ▶ Name of the class has to be the same as the name of the .java file



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 - ▶ The particular form of main is required by Java.
 - ▶ JVM starts executing here!
 - ▶ main is a static method, it is part of its class and not part of objects.
 - ▶ Strings in Java are sequence of characters



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- ▶ Braces { } are used to collect statements into a "block"
- ▶ Statements in Java end with semicolons.



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Printing

- ▶ `println`: New line after printing
- ▶ `print`: No new line
- ▶ `printf`: Can specify format - may learn this later



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Character Strings

string literal in class `String`

`"ABC"`

`"This is interesting"`

`""`

`"91"`



Character Strings

string literal in class `String`

“ABC”

“This is interesting”

“ ”

“91”

- ▶ Use `print` or `println` methods to print a character string to the terminal
- ▶ `System.out.println("CMPSC 111");`
- ▶ the string “CMPSC 111” is a **parameter**: data sent to a method



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String Concatenation

appending one string to the end of another: use + operator

“This is ” + “interesting”

“Your grade is ” + “91”



String Concatenation

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- ▶ + is also used for arithmetic addition
- ▶ `System.out.println(" Adding " + 12 + 23);` is not the same as
`System.out.println(" Adding " + (12 + 23));`



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Escape Sequences

- ▶ Escape sequences, or escape characters, begin with a slash and are immediately followed by another character.
- ▶ This two-character sequence, inside “ ” allows you to control your output (\n, \t, \b) or output characters you wouldn't otherwise be able to (\\", \") inside a string.



Escape Sequences

Seq	Meaning	Example Code
\n	New line	System.out.println("Hi\nThere");
\t	Horizontal tab	System.out.println("What's\tup?");
\b	Backspace	System.out.println("Hi\b Hey");
\\"	Backslash	System.out.println("Back\\Slash");
\"	Double quote	System.out.println("Dbl\"Quote");