COMPUTER ENGINEERING WORKSHOP PRE-ENGINEERING PROGRAM @UPRM SUMMER 2009

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This workshop

- Purpose
  - Students should understand the basics of Artificial Intelligence
  - Students will be able to understand the process of coding
  - Get students acquainted with the concepts of object oriented programming and Java
- Audience
  - High School Students
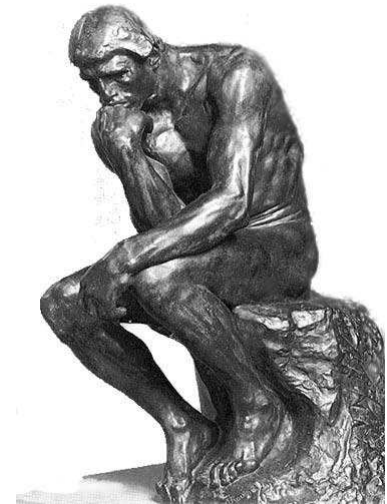
1st Part: A System

- Overview of a computing system and its components
  - Demonstration of SWORD by
    - Edward Betancourt
    - Rogelio Cardona
    - Ramon Gonzalez
    - Willie Gonzalez

2nd Part: Artificial Intelligence

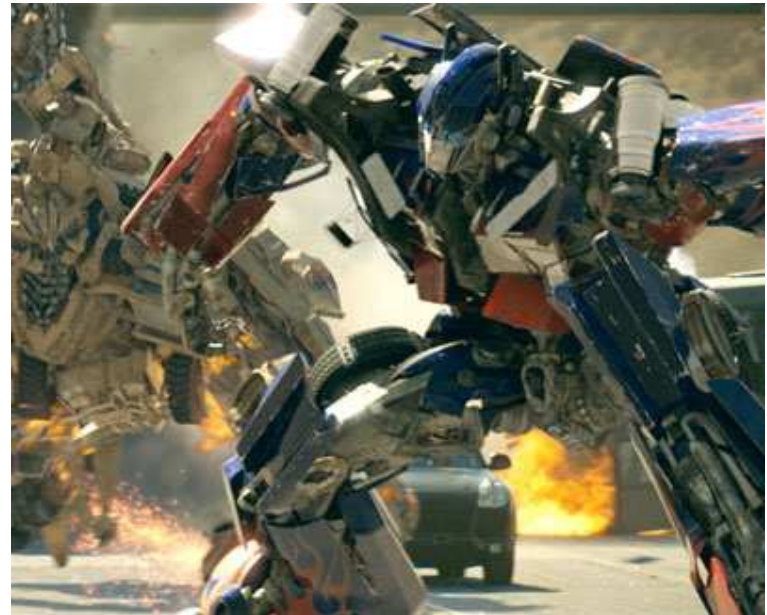- **Concept of Artificial Intelligence (AI)**
  - **Definition from dictionary [1].**
    - The ability of a computer or other machine to perform those activities that are normally thought to require intelligence.
    - What is Intelligence?
      - The capacity to acquire and apply knowledge.
      - The faculty of thought and reason.
      - Superior powers of mind.

Common day activities

□ Can you make a computer:

  ▫ Cross a street without being hit by a car?

  ▫ Recognize someone?

  ▫ Understand what are you saying?

  ▫ Smile when a joke has been told?

  ▫ Climb a stair?

  ▫ Skip an obstacle?

All these tasks need reasoning on knowledge.

Why do we want AI?

- To understand human reasoning better. By emulating the human reasoning with computer programs, we can test the theories on human intelligence.

- To create useful "smart" programs able to do tasks that would normally require a human expert.

Taken from [2].

Who works on AI?

- Many disciplines contribute to goal of creating/modelling intelligent entities:
  - Computer Science
  - Psychology (human reasoning)
  - Philosophy (nature of belief, rationality, etc)
  - Linguistics (structure and meaning of language)
  - Human Biology (how brain works)
- Subject draws on ideas from each discipline.
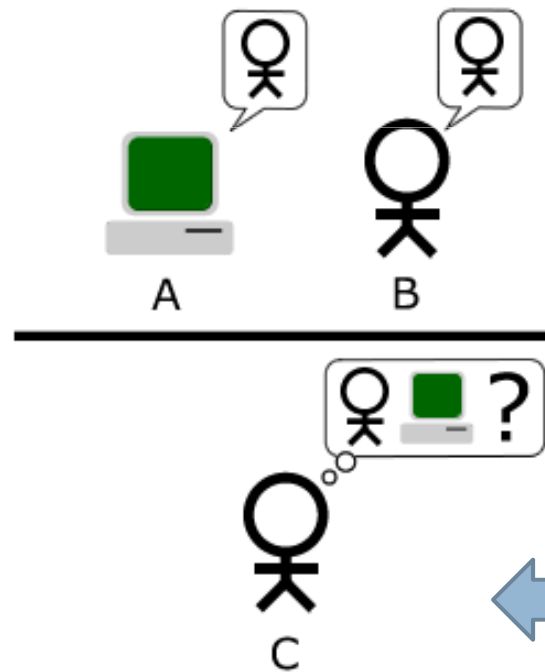
Taken from [2].

Typical AI Problems

- Intelligent entities (or "agents") need to be able to do both "mundane" and "expert" tasks

- Often "mundane" tasks are the hardest.

- Mundane tasks - going shopping:

  - *Planning* a route, and sequence of shops to visit!

  - *Recognising* (through *vision*) buses, people.

  - Communicating (through *natural language*).

  - *Navigating* round obstacles on the street, and *manipulating* objects for purchase.

- Expert tasks are things like:

  - medical diagnosis.

  - equipment repair.

Taken from [2].

Philosophy

- Can a machine be intelligent?
  - Turing test: Test if a machine is intelligent

If he/she cannot tell who is human and who is machine, then the machine is "intelligent".

Taken from [3].

Example

- System winning Loebner prize
  - Contest for the most human-like conversation system.

- Conversation
  - Program: No worries! Hey! I didn't come here to be subjected to bad language! How rude!
  - Judge: Sorry, sorry. Didn't mean to offend. So, how old are you?
  - Program: That's OK. Just don't do it again. Well, should my age really matter. Just for the record I'm 24. How old are you then.

- But...
  - System was based on fairly simple methods, with pre-stored amusing replies.
  - Human-like performance doesn't guarantee intelligence.

3rd Part: Today's Task for YOU

- Program the artificial intelligence of a robot in Java.
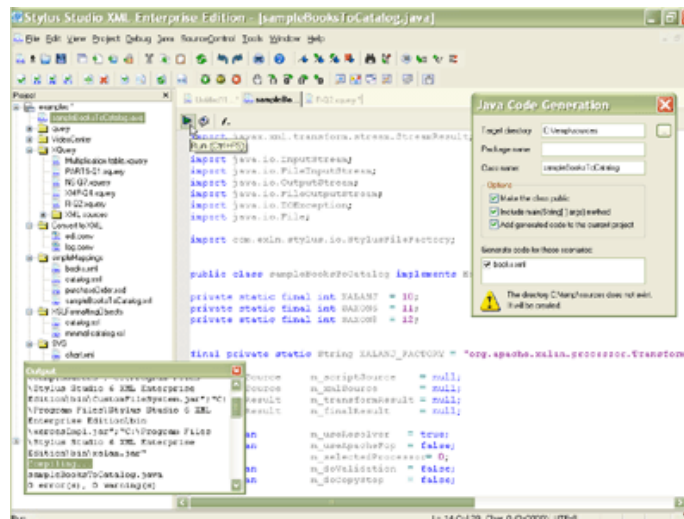
But…..????????

- What is a program?

- What is Java?

- How to program a robot?

WHAT IS A PROGRAM?

What is a program?

- Computer programs (also software programs or just programs) are instructions for a computer.

- Computers require programs to function.
  - Central processing unit (CPU) execute the instructions given by a program.

From [3]

Exercise: Let's give instructions

- Need two volunteers
- One will tell the other student to pick up a cup.
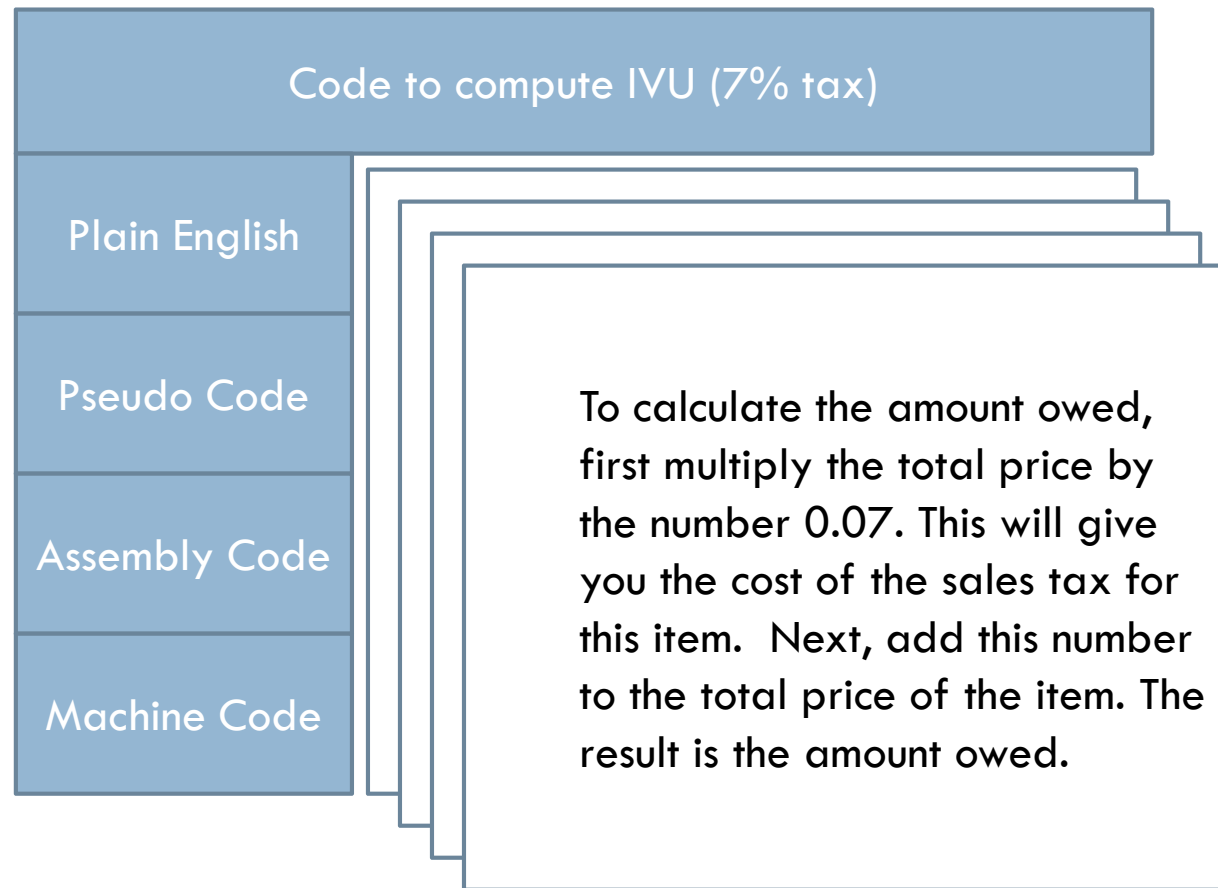 - Give instructions.

- Were you able to follow?

Levels of Abstraction

- Computer is a bunch of transistors……

Levels of Abstractions

Code to compute IVU (7% tax)	
Plain English	To calculate the amount owed, first multiply the total price by the number 0.07. This will give you the cost of the sales tax for this item. Next, add this number to the total price of the item. The result is the amount owed.
Pseudo Code	
Assembly Code	
Machine Code	

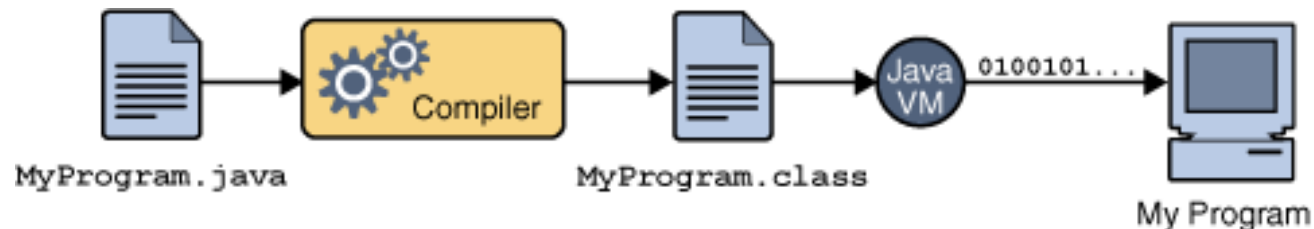Example taken from [4]

WHAT IS A JAVA?

The Java Programming Language

- The Java programming language is a high-level language:

  - Simple
  - Architecture neutral
  - Object oriented
  - Portable
  - Distributed

  - High performance
  - Multithreaded
  - Robust
  - Dynamic
  - Secure

Java

- Source code is first written in plain text files ending with the .java extension.

- Source files are compiled into .class files by the javac compiler.

- A .class file does not contain code that is native to your processor; it instead contains *bytecodes* — the machine language of the Java Virtual Machine (Java VM).

- The java launcher tool then runs your application with an instance of the Java Virtual Machine.

MyProgram.java → Compiler → MyProgram.class → Java VM 0100101... → My Program

WHAT IS A ROBOCODE?

Robocode

- **Robocode** is an Open Source educational game started by Mathew Nelson.
  - Developer Flemming N. Larsen
- Programming Game
  - Goal
    - Code a robot to compete against other robots in a battle arena.
    - The player is the programmer of the robot, who will have no direct influence on the game.
    - The player must write the **Artificial Intelligence** of the robot.
      - Tell how to behave and react on events occurring in the battle arena.

Why Robocode

- The name Robocode is a short for "Robot code".

- The game is designed to help people learn to program in Java and enjoy the experience.

  - It is very easy to start - a simple robot can be written in just a few minutes - but perfecting a bot can take months or more.

http://robocode.sourceforge.net/

YOUR TASKS:

- Run robocode.
- Go to the following web page:
  - http://robowiki.net/w/index.php?title=Robocode
  - Follow the tutorial, it is very simple.
  - Program your own robot's behavior in Java.
    - Please use your name and initials for your robot.
    - Example: naydags (Nayda G. Santiago) or josejr (Jose Javier Rodriguez)
    - Another tutorial at http://www.ibm.com/developerworks/java/library/j-robocode/index.html
  - Share the robot with us.

Summary

- Code is used to control a computer

- Artificial Intelligente (AI) attempts to give intelligence to a machine

- Java is a widely used high level language to code.

- Robocode is a tool to teach Java.

References

1. Answers.com (Dictionary definitions)

2. Artificial Intelligence Introduction, Alison Cawsev and Ruth Aylett, Presentation, School of Maths and Computer Science, Montbatten Building, Heriot-Watt University, Edinburgh

3. Wikipedia.org, Turing test and Computer Program Definition.

4. http://courses.cs.vt.edu/csonline/ProgrammingLanguages/Lessons/Introduction/index.html

5. http://robocode.sourceforge.net/

6. http://robowiki.net/w/index.php?title=Robocode