Introduction To CPSC 231 And To Computer Science

James Tam

Administrative (James Tam)

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  - Office hours: MT 12:00 – 12:50
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  - Appointment: phone or call
  - Drop by for urgent requests (but no guarantee that I will be in!)

A Bit About CPSC 231

- It is a course geared primarily towards CPSC majors
- It is not assumed that you have prior knowledge of Computer Science
- It can be a lot of work

How To Succeed In This Course

- Practice things yourself.
  - Write programs.
  - Trace lots of code

Leonardo da Vinci

J.R.R. Tolkien

Amadeus Mozart

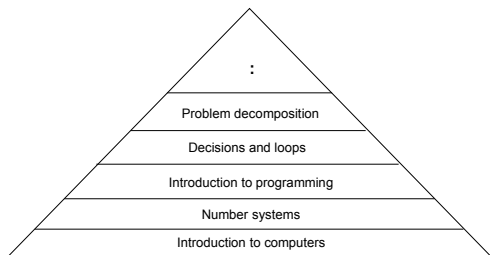Bruce Lee

Wayne Gretzky

## How To Succeed In This Course (2)

- Make sure that you keep up with the material
  - Many of the concepts taught later depend upon your knowledge of earlier ones.
 - Don't let yourself fall behind!

:

Problem decomposition

Decisions and loops

Introduction to programming

Number systems

Introduction to computers

This Course Teaches Programming Principles

- The required structure for a computer program
- Principles of writing good programs
- You will then need to apply these principles throughout the term

http://accurapid.com/journal/04stndrd.htm

Identifier

Letter

Letter   Digit
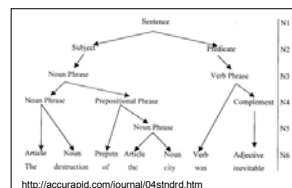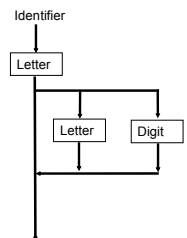
Feedback

How You Will Be Evaluated

- Assignments (*Total value 30%*)
  - Assignment 1: Introduction to the Computer Science environment (*Worth 1%*)
  - Assignment 2: Non-decimal number systems, representations and logic (*Worth 3%*)
  - Assignment 3: Modifying and writing simple programs (*Worth 1%*)
  - Assignment 4: Decisions, loops (*Worth 3%*)
  - Assignment 5: Problem decomposition, 1D arrays (*Worth 4%*)
  - Assignment 6: 2D arrays (*Worth 6%*)
  - Assignment 7: Lists - Version 1 implemented using an array of records (*Worth 6%*)
  - Assignment 8: Lists – Version 2 implemented using a linked list (*Worth 6%*)

How You Will Be Evaluated (2)

- Exams (*Total value 70%*)
  - Midterm exam (30%): In class during normal lecture time
  - Final exam (40%): TBA (scheduled by the Registrar's Office)

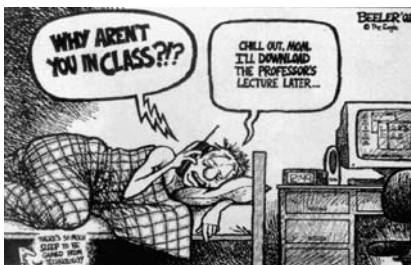## Course Resources

- Course website: http://pages.cpsc.ucalgary.ca/~tamj/231
- Course directory: /home/231
- Recommended course textbooks:
  (Pascal programming)
  1. Pascal Programming & Problem Solving, 4th Edition, Leestma/Nyhoff (Prentice Hall)

  (Unix)
  1. A Practical Guide to Solaris, Sobell (Addison-Wesley)
  2. (A good alternative) Harley Hahn's Student Guide to Unix, Hahn (McGraw-Hill)

How To Use The Course Resources

- They are provided to support and supplement the class.

- Neither the course notes nor the text books are meant as a substitute for regular attendance to lecture and the tutorials.

Introduction To Computer Science

- What is Computer Science?

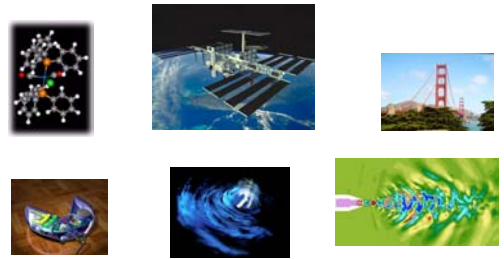## Introduction To Computer Science

•What is Computer Science?

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Introduction To Computer Science

•Computer Science is about problem solving

Some of the picture sources include: Star Trek: Deep space 9 © Paramount & the international space station
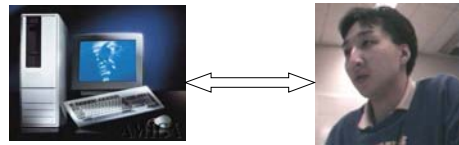
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Some Areas Of Study

•Human-Computer Interaction
•Computer Graphics
•Information Visualization
•Databases
•Computer Theory
•Simulations
•Artificial Intelligence
•Computer Vision
•Software Engineering
•Games programming

This list provides only a brief introduction to the different areas of Computer Science and is far from comprehensive:
For a more complete list: http://www.cpsc.ucalgary.ca/Research/

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Human-Computer Interaction

•Considers how people work with and use computers

Technological perspective

Human perspective

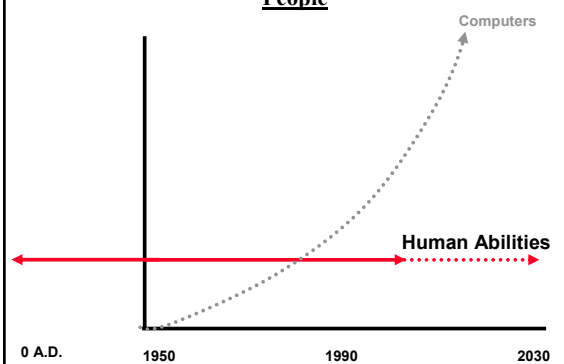For more information: http://grouplab.cpsc.ucalgary.ca/

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Moore's Law: Computers

Speed

Computer Abilities

1950   **1990**   **2030**
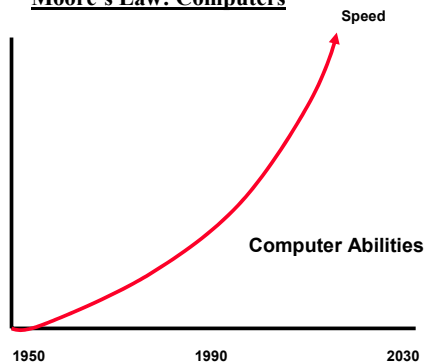
These graphs are variations of those presented by Bill Buxton

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People

Computers

Human Abilities

0 A.D.   **1950**   **1990**   **2030**

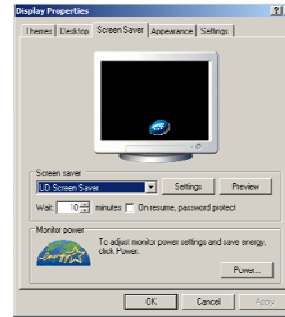These graphs are variations of those presented by Bill Buxton

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Human Perspective: Issues

•How people process information
•Memory, perception, motor skills, attention etc.
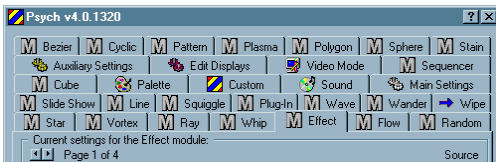•Language, communication and interaction

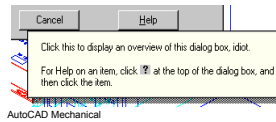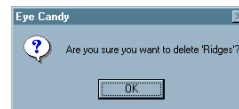## Human-Computer Interaction: Not Just Common Sense Information

Human-Computer Interaction: Not Just Common Sense Information (2)

Human-Computer Interaction: Not Just Common Sense: Information (3)

AutoCAD Mechanical

Computer Graphics

•Concerned with producing images on the computer.

Scene from MechWarrior 4: Vengeance © Microsoft

For more information: http://jungle.cpsc.ucalgary.ca/

Computer Graphics: Issues

•How to make the images look "real"?
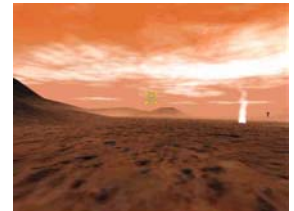
From http://klamath.stanford.edu/~aaa/   From ACM SIGGRAPH: Vol.32 No.2 May 1998
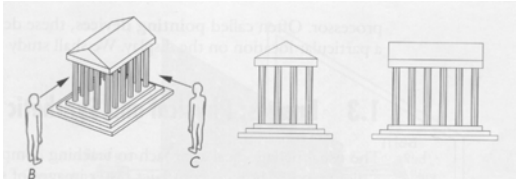
Computer Graphics: Highly Mathematical

•Highly mathematical

Computer Graphics: Still A Long Way To Go

•"Even though modeling and rendering in computer graphics have been improved tremendously in the past 35 years, we are still not at the point where we can model automatically, a tiger swimming in the river in all it's glorious details." [1]
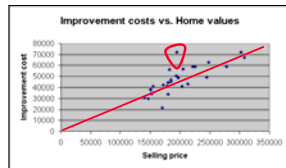
Information Visualization

•Finding ways of representing information in a way that amplifies cognition.

Information Visualization: Issues

•What is the "best" way of representing the information?
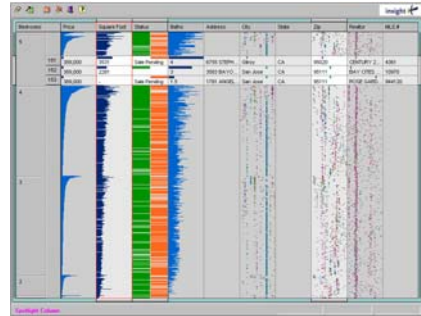
Databases

•Concerned with the efficient storage, retrieval and distribution of information
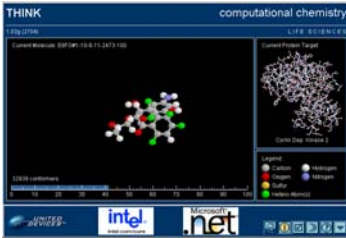•It can be a difficult challenge!
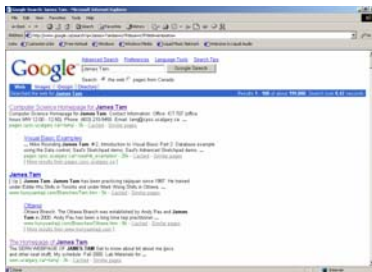
Databases (2)

•Concerned with the efficient storage, retrieval and distribution of information
•It can be a difficult challenge!

Results 1 - 100 of about 199,000. Search took 0.42 seconds.

Computer Theory

- Deals with the mathematical aspects of computers
  - e.g., Distributed Computing, Computer Security

THINK © United Devices Inc. is part of a distributed Cancer research project.
For more information go to http://www.ud.com
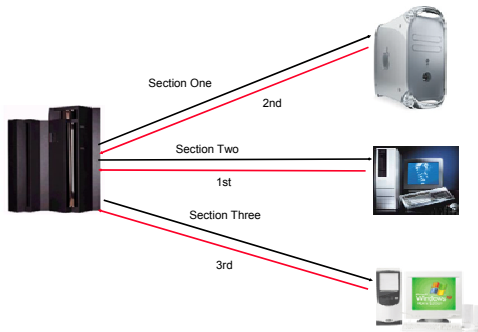
Computer Theory: Distributed Computing

- One issue: Ensuring proper order

Computer Theory: Distributed Computing (2)

Section One   2nd

Section Two   1st

Section Three   3rd

Computer Theory: Computer Security

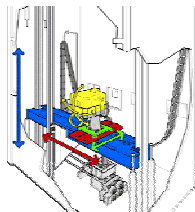- Cryptography (encoding data) has become increasingly important since the advent of the Internet

Original information

Encrypted data
J~:>^@^@^@.^@9
^@^P^@^Y^G^@^
Z
^@^B^@^Y
^@^B^@^[
^@^B^@^\
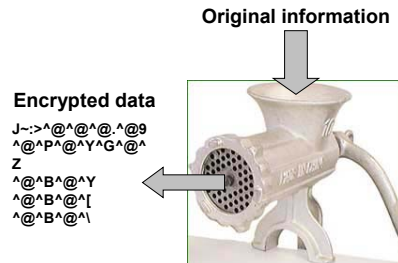
Simulations

- Recreating behaviour by an analogous model or situation to gain information more conveniently or to train personnel.

Images from http://www.simlabs.arc.nasa.gov/vs.

Simulations (2)

- Why simulate?
  - Complex systems
  - Dangerous experiments
  - Controlled conditions
  - Cost savings

Simulations: Some Issues

•What information should be included in the simulation?
•How confident are we in the results of the simulation?
•Speed of the simulation.

Artificial Intelligence

•What makes a person smart?
•How do we build a smart machine?
  - How to make a machine think like a person?
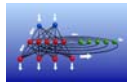 - How to make a machine behave like a person?

Artificial Intelligence (2)
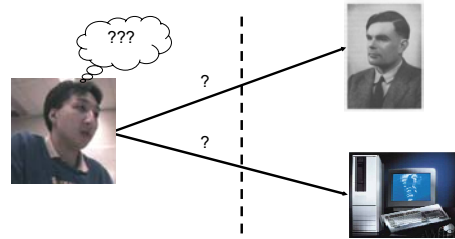
• Approaches:
  1) Top-down

  2) Bottom-up

Artificial Intelligence (3)

•How do we know we have a "smart machine"?
  - The Turing test

Artificial Intelligence (4)

•Much work still needs to be done

Computer Vision

•Determining what an object is based on it's visual appearance
  - e.g. Six?

•Issues: What are the consequences of the computer misrecognizing something?

Software Engineering

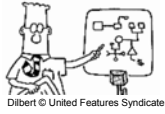- 63% of large software projects go over cost
  - Insufficient user-developer communication and understanding
  - Software:
    - Is not easily used
    - Is never tested until it is too late
  - :   :   :

Dilbert © United Features Syndicate

- Avoid "hacking-out" software
  - "How does the program work? I don't know!!!???"
- Involves developing systematic ways of producing good software on time and within budget

Games Programming

- Pulls together many areas of Computer Science
- The U of C was the first Canadian university to offer this area of study.

Blatant advertisement!!!

WarCraft III © Blizzard Entertainment