Introduction To CPSC 231 And To Computer Science

James Tam

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  - Appointment: email, phone or call
  - Drop by for urgent requests (but no guarantee that I will be in!)

James Tam

A Bit About CPSC 231

- It is a course geared primarily towards CPSC majors
- But 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

Bruce Lee

Amadeus Mozart
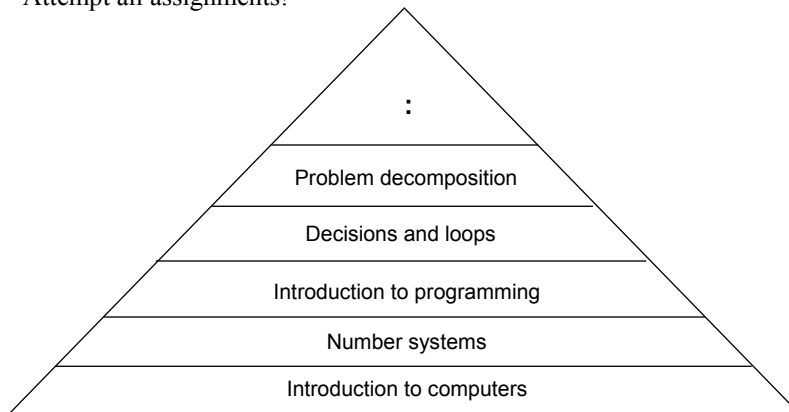
Wayne Gretzky

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!
  - Attempt all assignments!

:

| 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

Feedback

???
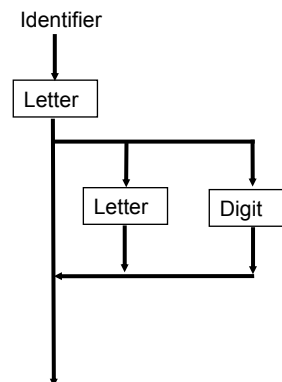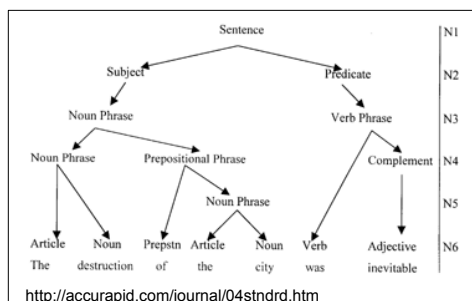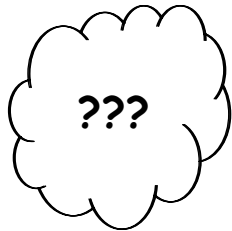
How You Will Be Evaluated

- Assignments (*Total value 30%*)
  - Assignment 1: Introduction to the Computer Science environment (*Worth 1%*)
  - Assignment 2: Non-decimal number systems, number 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 and file input/output - 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)

Note: You need to pass the examination component (the average of the midterm and final) in order to receive a term grade that is higher than a D+.
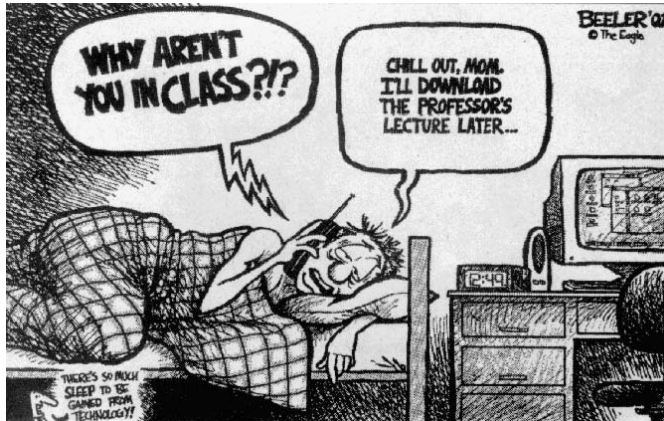
Course Resources

- Course website: http://pages.cpsc.ucalgary.ca/~tamj/231
- Course directory: /home/231 (accessed via your Unix Computer Science account)
- 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 this class.

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

How To Use The Course Resources (2)

```
procedure add (var head      : NodePointer;
               var newNode : NodePointer);
var
  temp : NodePointer;
begin
  if (head = NIL) then
    head := newNode
  else
  begin
    temp := head;
    while (temp^.next <> NIL) do
      temp := temp^.next;
    temp^.next := newNode;
  end;
  newNode^.next := NIL;
end;
```

Introduction To Computer Science

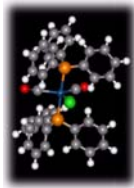•What is Computer Science?

Introduction To Computer Science

•What is Computer Science?

Introduction To Computer Science

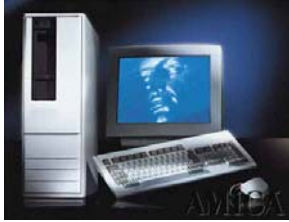•Computer Science is about problem solving
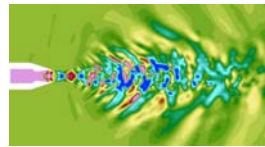
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Some Areas Of Study

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

Human-Computer Interaction

•Considers how people work with and use computers

Technological perspective

Human perspective
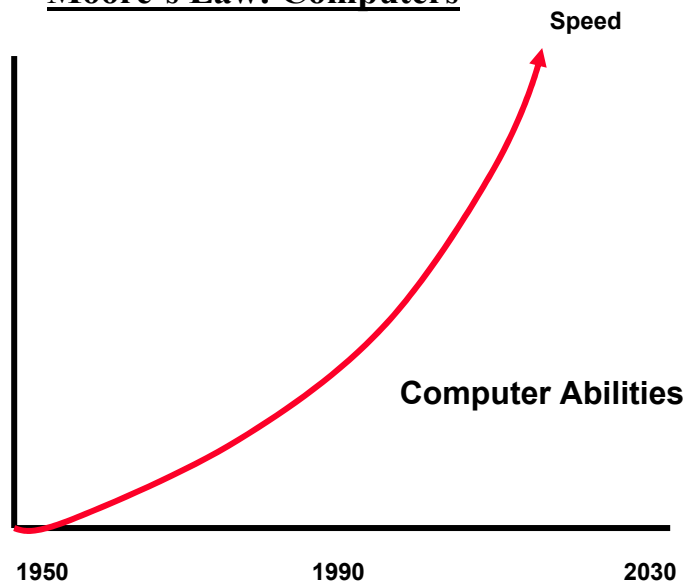
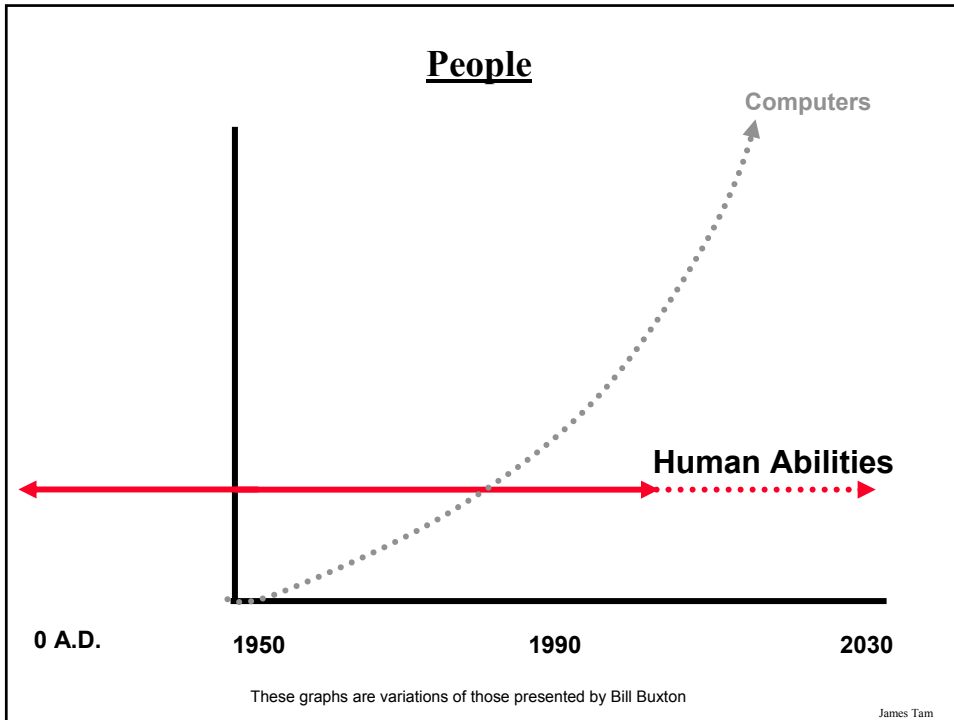
Moore's Law: Computers

Speed

Computer Abilities

| 1950 | 1990 | 2030 |

These graphs are variations of those presented by Bill Buxton

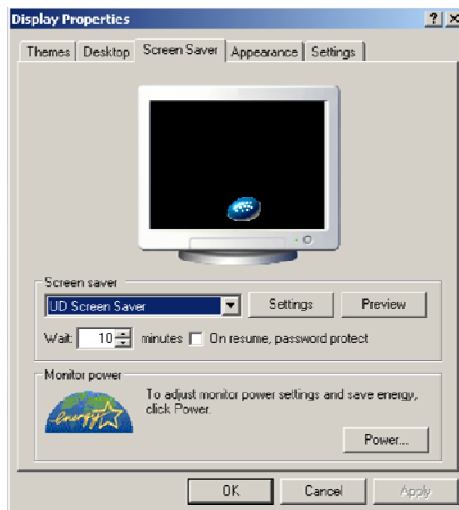# People

Computers

Human Abilities

0 A.D.   1950   1990   2030

These graphs are variations of those presented by Bill Buxton
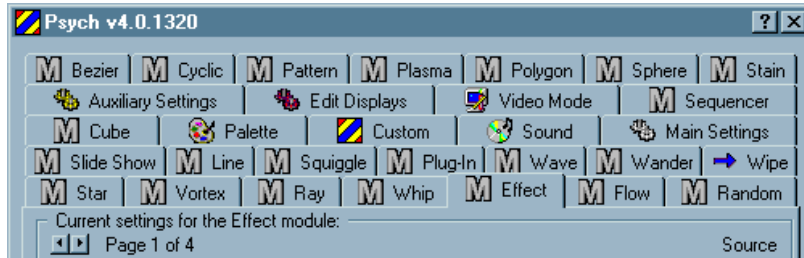
Human-Computer Interaction: Not Just Common Sense Information

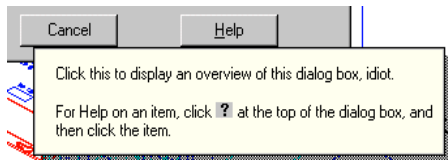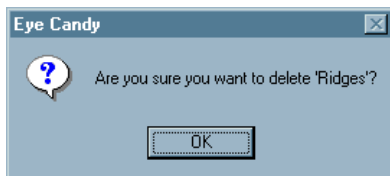# Human-Computer Interaction: Not Just Common Sense Information (2)

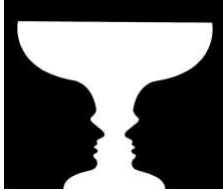# Human-Computer Interaction: Not Just Common Sense: Information (3)

Human Perspective: Some Of The Issues

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

Computer Graphics

•Concerned with producing images on the computer.

Scene from MechWarrior 4: Vengeance © Microsoft

Computer Graphics: Issues

•How to make the images look "real"?

From http://klamath.stanford.edu/~aaa/
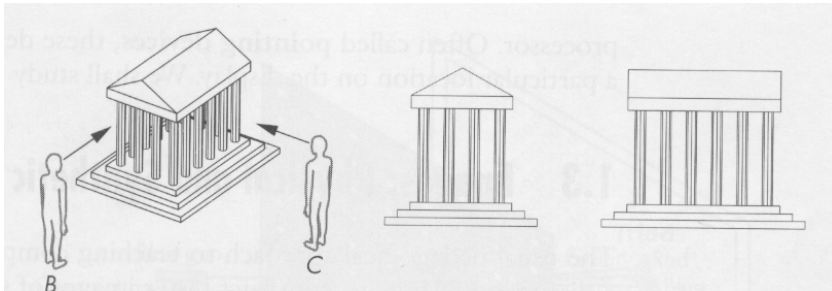

Final Fantasy: The spirits within © 2001 - Columbia Pictures

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]


[1] From "The Tiger Experience" by Alain Fournier at the University of British Columbia

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Information Visualization

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

|	A	B
1	Market value ($)	Improvement cost ($)
2	140000	31120
3	147000	29980
4	151000	38120
5	152000	34360
6	155000	40710
7	170000	21620
8	172000	42100
9	178000	41070
10	180000	34210
11	180000	44090
12	182000	55960
13	185000	45170
14	185000	46820
15	193400	50200
16	194500	71860
17	197000	48460
18	203000	40720
19	205000	56600
20	213000	42780
21	221000	58770
22	225000	58960
23	245000	48910
24	248000	62620
25	278000	58580
26	302500	72200
27	308000	67320

For more information: http://innovis.cpsc.ucalgary.ca/
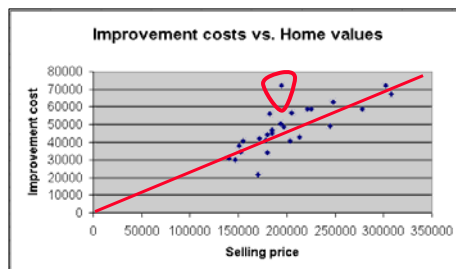
Information Visualization: Issues

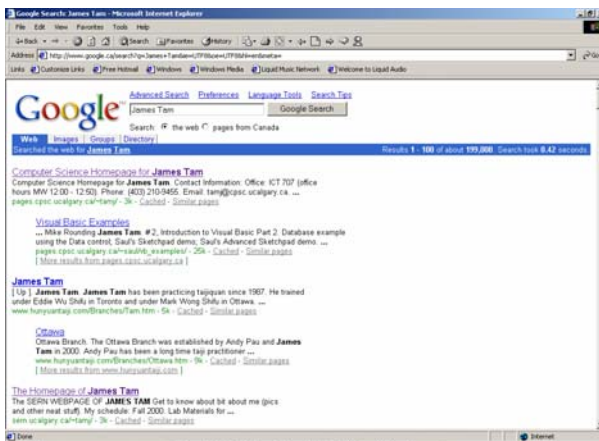• What is the "best" way of representing the information?
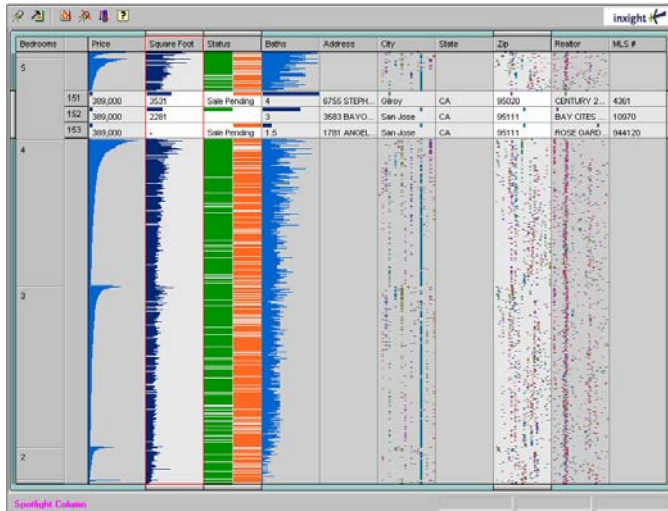
The Table Lens: Ramana R. and Stuart K. Card Xerox Palo Alto Research Center

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Databases

• Concerned with the efficient storage, retrieval and distribution of information

• It can be a difficult challenge!

For more information: http://www.adsa.cpsc.ucalgary.ca/

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

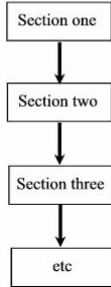- Deals with the mathematical attributes of Computer Science
  - e.g., Distributed Computing, Computer Security

THINK © United Devices Inc. is part of a distributed Cancer research project.
For more information go to: http://www.grid.org/projects/cancer/

Computer Theory: Distributed Computing

•One issue: Ensuring proper order

Section one

Section two

Section three

etc

Computer Theory: Distributed Computing (2)

Section One

2nd

Section Two

1st

Section Three

3rd
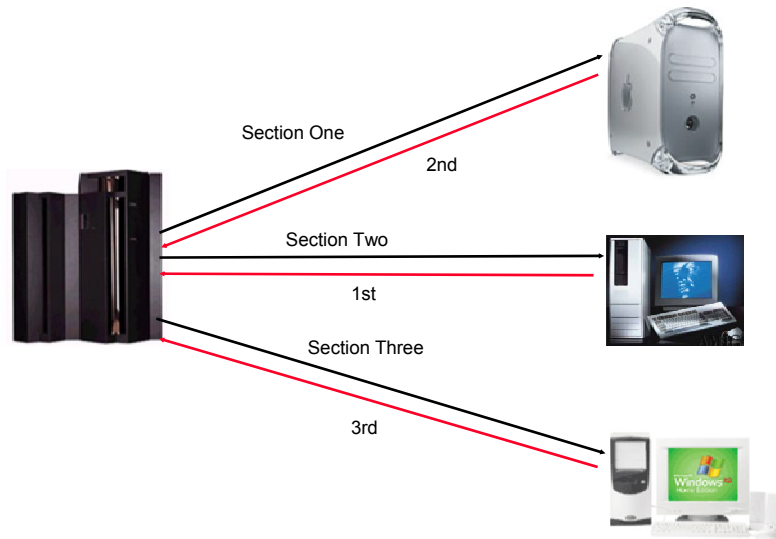
Computer Theory: Computer Security

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

Original information (e.g., Credit card #)

Encrypted data

J~:>^@^@^@.^@9
^@^P^@^Y^G^@^
Z
^@^B^@^Y
^@^B^@^[
^@^B^@^

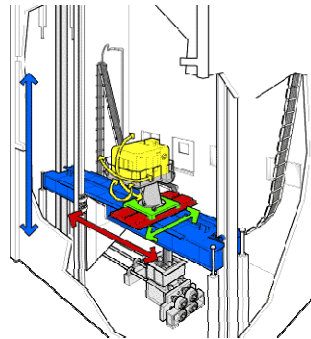
Simulations

• 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?
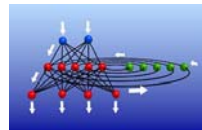 - How to make a machine behave like a person?

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
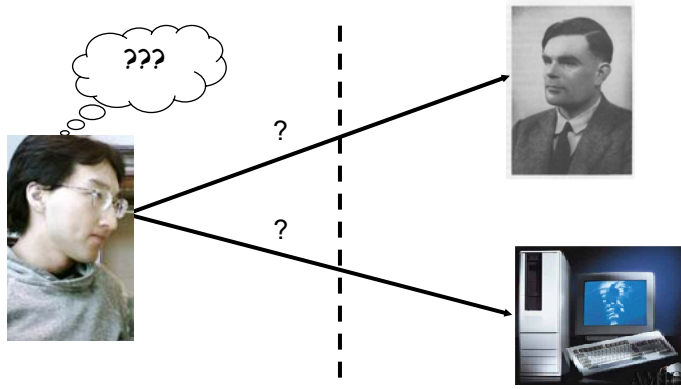
Artificial Intelligence (4)

• Much work still needs to be done

Photo from www.startrek.com © Paramount

Computer Vision

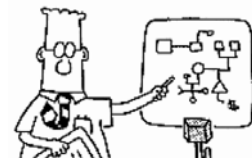- Determining what an object is based on it's visual appearance
  - e.g. Six?

- 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 University of Calgary was the first Canadian university to offer this area of study.

<< Warning!!! >>

Blatant advertisement

<< Warning!!! >>

Halo 2 © Microsoft

James Tam