

Introduction To CPSC 231 And To Computer Science

James Tam

James Tam

Administrative (James Tam)

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 - Drop by for urgent requests (but no guarantee that I will be in!)



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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



Wav file from "The Simpsons"

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How To Succeed In This Course

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



Leonardo da Vinci



Bruce Lee



J.R.R. Tolkien



Amadeus Mozart

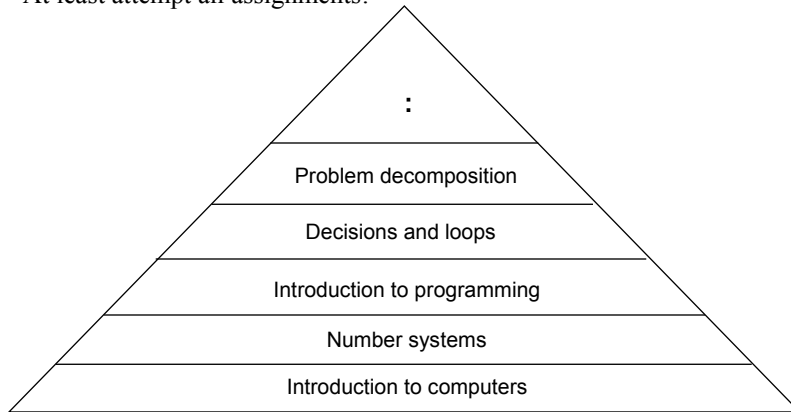


Wayne Gretzky

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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!
 - At least attempt all assignments!

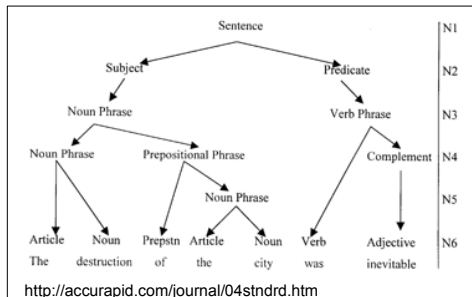


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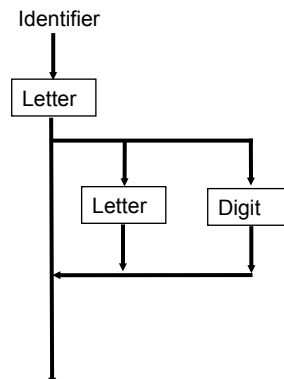
This Course Teaches Programming Principles

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

Learning the rules of the English language: grammar

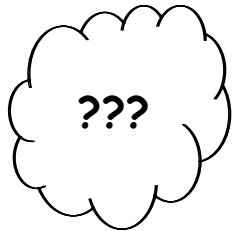


Learning the rules of the computer language: syntax



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Feedback



Dilbert © United Features Syndicate

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How You Will Be Evaluated

- Assignments (*Total value 40%*)
 - 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 simple programs (*Worth 1%*)
 - Assignment 4: Decisions, loops (*Worth 3%*)
 - Assignment 5: Problem decomposition (*Worth 3%*)
 - Assignment 6: 1D arrays (*Worth 5%*)
 - Assignment 7: 2D arrays (*Worth 8%*)
 - Assignment 8: Lists and file input/output, version 1 implemented using an array of records (*Worth 8%*)
 - Assignment 9: Lists and file input/output, version 2 implemented using a linked list (*Worth 8%*)

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How You Will Be Evaluated (2)

- Exams (*Total value 60%*)
 - Midterm exam (25%): In class during normal lecture time
 - Final exam (35%): 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+.

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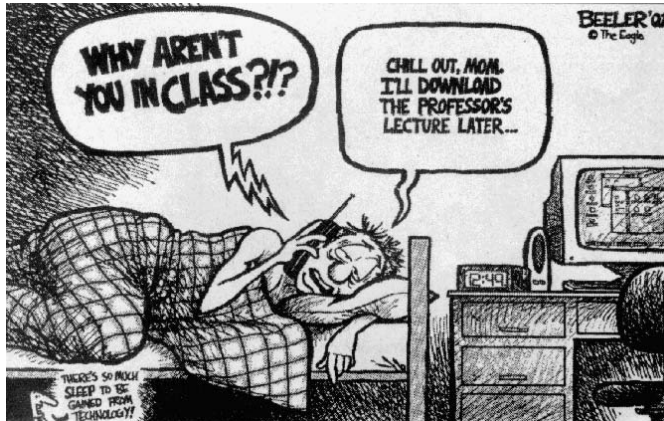
Course Resources

- 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)

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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.



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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;
```

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Introduction To Computer Science

- What is Computer Science?



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Introduction To Computer Science

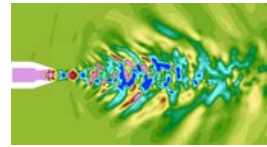
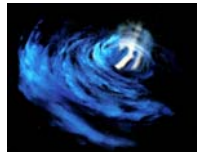
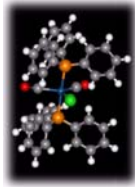
- What is Computer Science?



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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 And Research In Computer Science

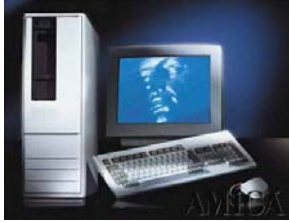
- Human-Computer Interaction
- Computer Graphics
- Information Visualization
- Databases
- Computer theory
- Computer networking and distributed systems
- Simulations
- Artificial Intelligence
- Computer Vision
- Software Engineering
- Games programming

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

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Human-Computer Interaction

- Considers how people work with and use computers



Technological perspective

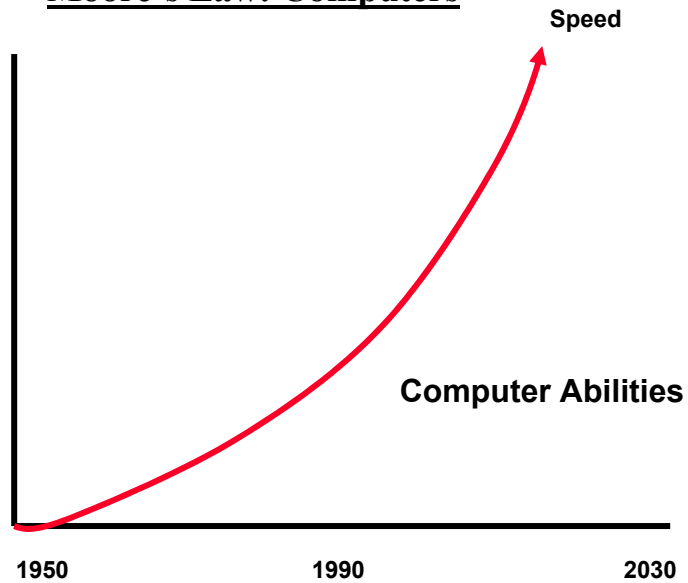


Human perspective

For more information: <http://grouplab.cpsc.ucalgary.ca/> or <http://pages.cpsc.ucalgary.ca/~ehud/Research.html>

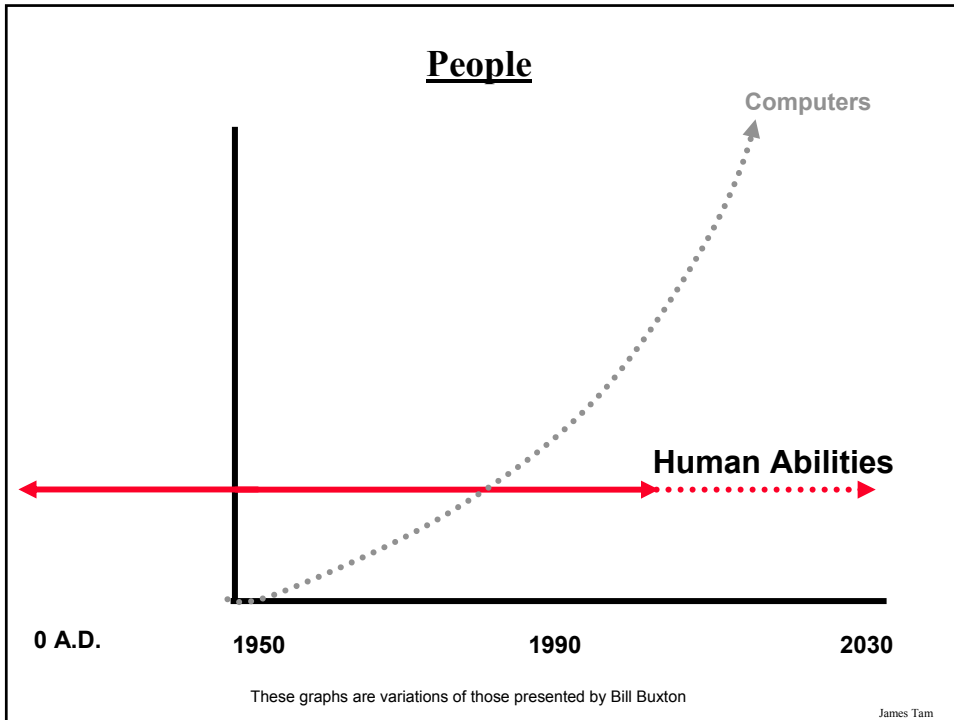
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Moore's Law: Computers

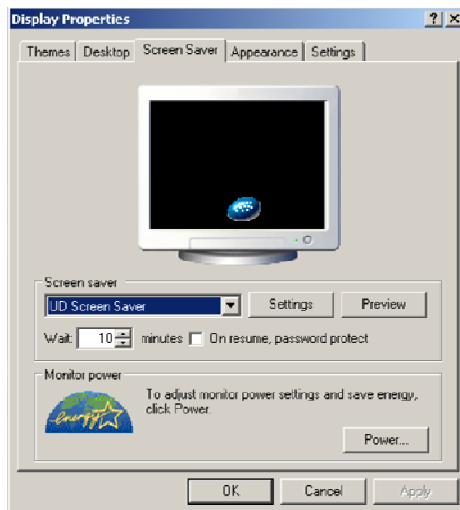


These graphs are variations of those presented by Bill Buxton

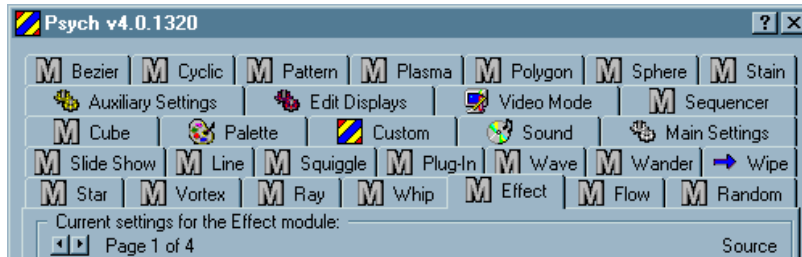
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Human-Computer Interaction: Not Just Common Sense Information

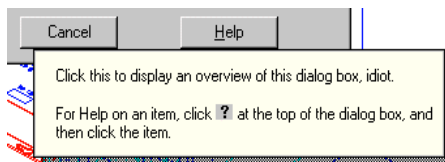
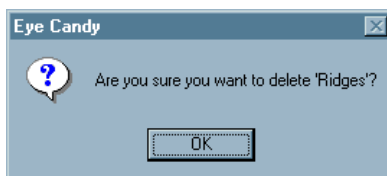


Human-Computer Interaction: Not Just Common Sense Information (2)



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

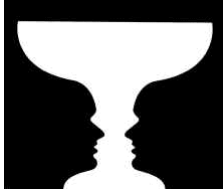


AutoCAD Mechanical

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Human Perspective: Some Of The Issues

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



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Computer Graphics

- Concerned with producing images on the computer.



Scene from MechWarrior 4: Vengeance © Microsoft

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

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Computer Graphics: Issues

- How to make the images look “real”?



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

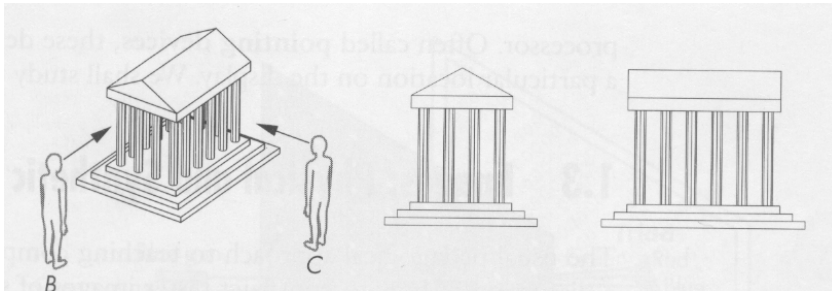


Final Fantasy: The spirits within © 2001 - Columbia Pictures

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Computer Graphics: Highly Mathematical

- Highly mathematical



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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



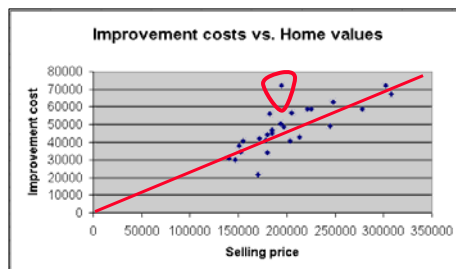
¹ From “The Tiger Experience” by Alain Fournier at the University of British Columbia

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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	56960
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

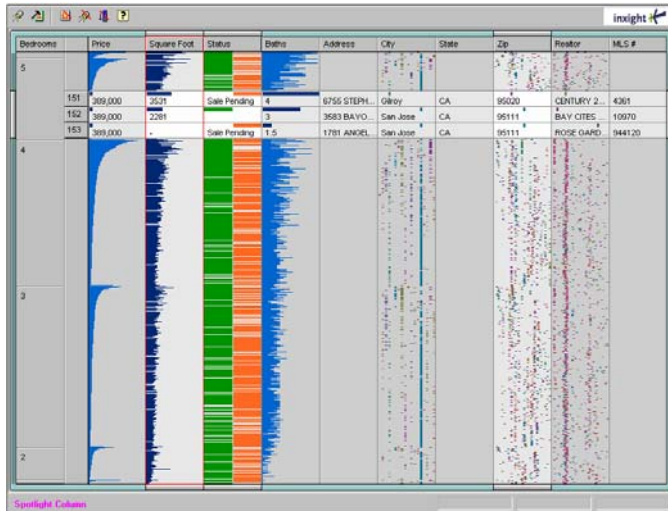


For more information: <http://innovis.cpsc.ualgary.ca/>

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Information Visualization: Issues

- What is the “best” way of representing the information?

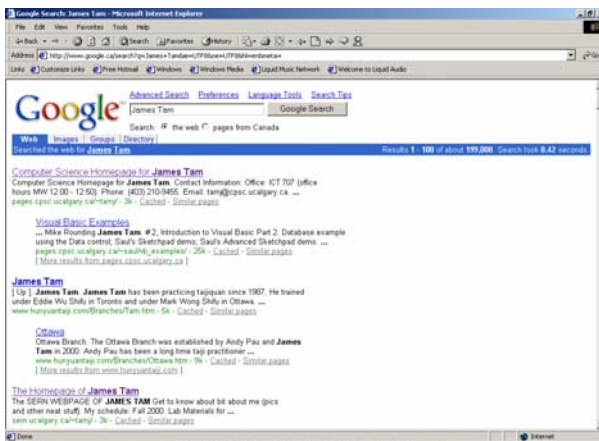


The Table Lens: Ramana R. and Stuart K. Card Xerox Palo Alto Research Center

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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/>

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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.

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Computer Theory

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

THINK computational chemistry

1.03g (2794) LIFE SCIENCES

Current Molecule: EBF0#1-10-B-11-2473-100

Current Protein Target: Cyclin Dep. Kinase 2

Legend:

- Carbon
- Oxygen
- Sulfur
- Hydrogen
- Nitrogen
- Hydro Atom(s)

32939 conformers

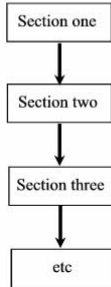
UNITED DEVICES intel.com/care Microsoft .NET

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

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Computer Theory: Distributed Computing

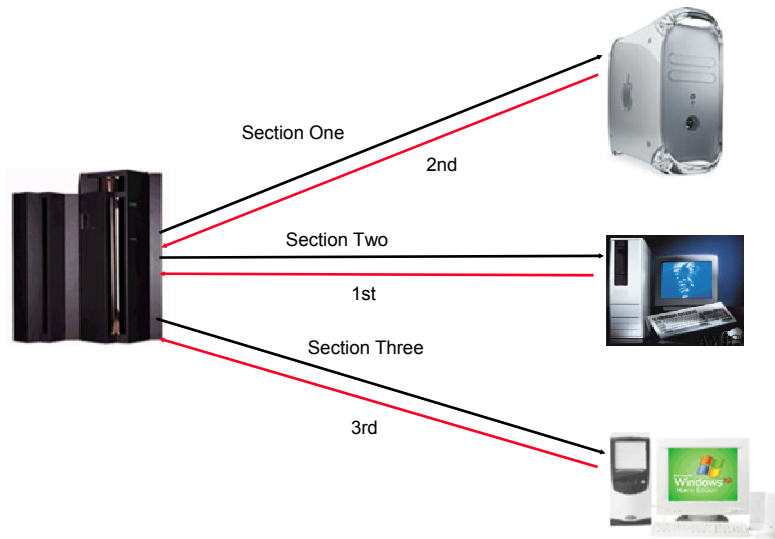
- One issue: Ensuring proper order



For more information: <http://pages.cpsc.ualgary.ca/~higham/Research/research.php>

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Computer Theory: Distributed Computing (2)



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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^@^\\
```



For more information: <http://www.cpsc.ucalgary.ca/Research/qcc.php/>

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Computer Networking And Distributed Systems

- The advantages of working remotely (through a network or the Internet) are so obvious that it's now all taken for granted.



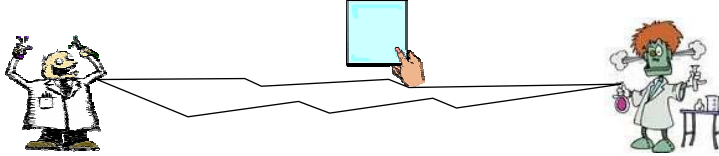
For more information: <http://grid.ucalgary.ca/>, <http://www.westgrid.ca/> or <http://pages.cpsc.ucalgary.ca/~mahanti/>

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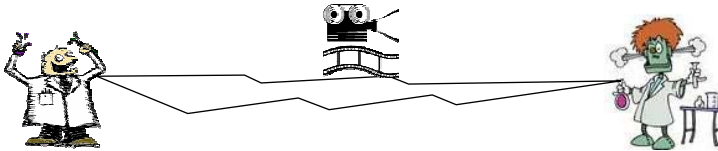
Computer Networking And Distributed Systems (2)

- This area of research focuses on ensuring the efficient transmission of electronic information while minimizing transmission problems.

10 page paper: Transmission rate: 2400 bits per second is okay



2 hour video: Transmission rate: 10,000,000 bits per second is still too slow



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Computer Networking And Distributed Systems (3)

- Speed isn't the only issue... minimizing transmission problems



Terminator 2: Judgment Day © Lions Gate Home Entertainment

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Computer Networking And Distributed Systems (3)

- Speed isn't the only issue... minimizing transmission problems



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Computer Networking And Distributed Systems (3)

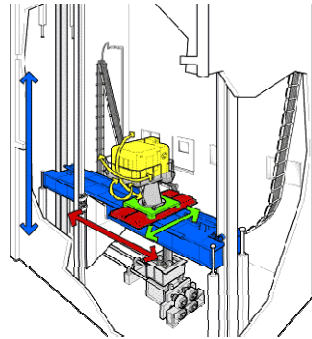
- Speed isn't the only issue... minimizing transmission problems



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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>.

For more information: <http://warp.cpsc.ualgary.ca/>

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Simulations (2)

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

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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.

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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?

For more information: <http://pages.cpsc.ucalgary.ca/~jacob/AI/> or <http://pages.cpsc.ucalgary.ca/~denzinge/>

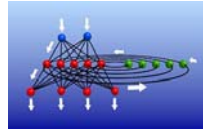
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Artificial Intelligence (2)

- Approaches:
 - 1) Top-down



- 2) Bottom-up

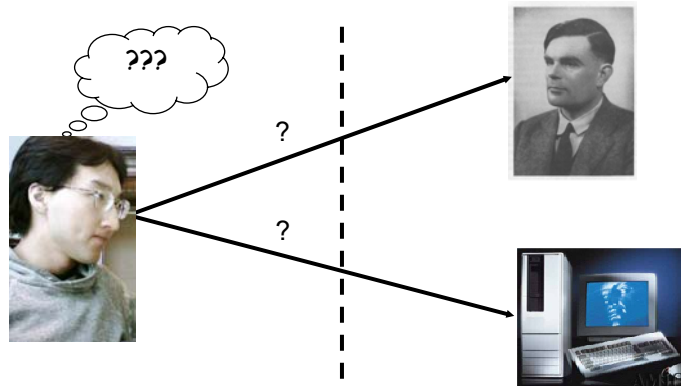


Images of the M1A and the neural network from the Pacific Northwest National Laboratory

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Artificial Intelligence (3)

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



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Artificial Intelligence (4)

- Much work still needs to be done



Photo from www.startrek.com © Paramount

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Computer Vision

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

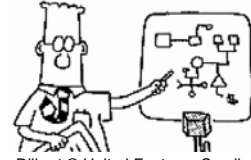


- Issues: What are the consequences of the computer misrecognizing something?

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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

For more information: <http://sem.ualgary.ca/>

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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

For more information: http://pages.cpsc.ualgary.ca/~parker/cpsc585-radical/the_site_2/CPSC585.html

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