Introduction To CPSC 231 And To Computer Science

James Tam

Administrative (James Tam)

- Contact Information
  - Office: ICT 707
  - Phone: 210-9455
  - Email: tamj@cpsc.ucalgary.ca
- Office hours
  - Office hours: MT 13:00 – 13:50
  - Email: (any time)
  - 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

Wav file from "The Simpsons"

How To Succeed In This Course

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

Leonardo da Vinci

Bruce Lee

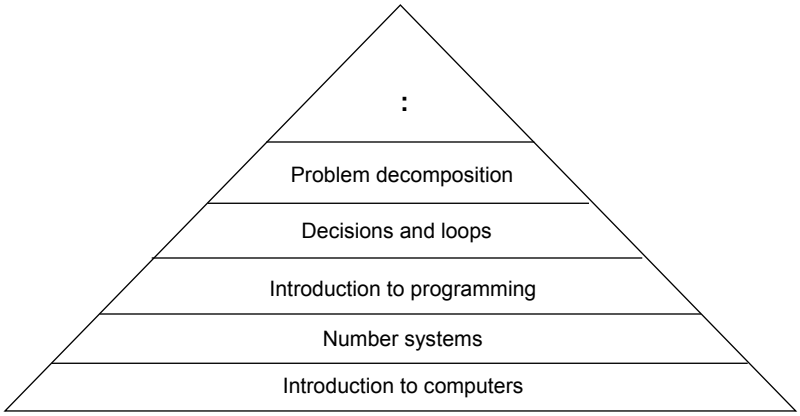
J.R.R. Tolkien

Amadeus Mozart

Wayne Gretzky

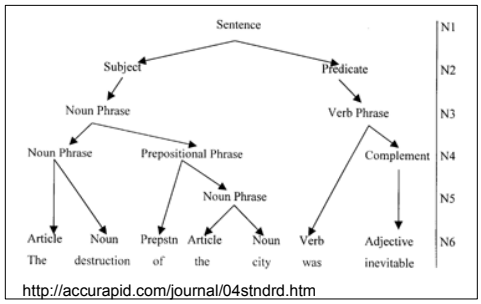
How To Succeed In This Course (2)

- 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!

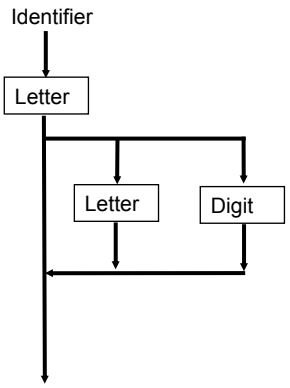


This Course Teaches Programming Principles

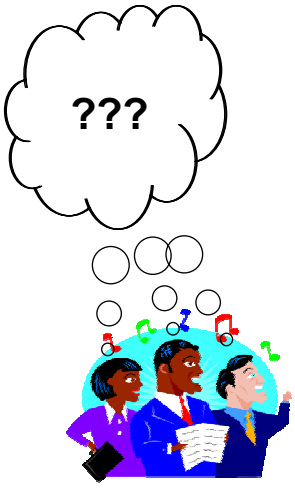
- The required structure for a computer program
- Principles of writing good programs
- You will then need to apply these principles throughout the term



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



Feedback



Dilbert © United Features Syndicate

James Tam

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%*)

James Tam

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)

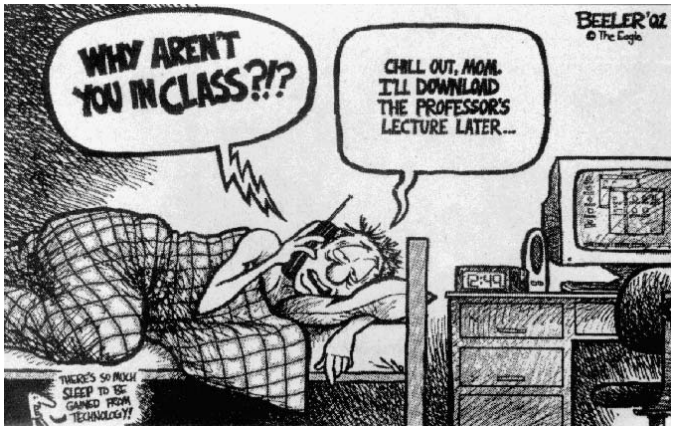
1. Pascal Programming & Problem Solving, 4th Edition, Leestma/Nyhoff (Prentice Hall)

(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

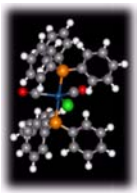
- What is Computer Science?

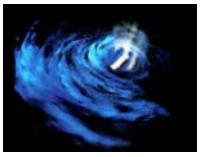
Introduction To Computer Science

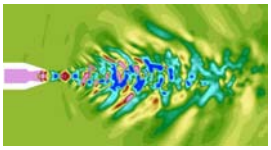
•What is Computer Science?

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

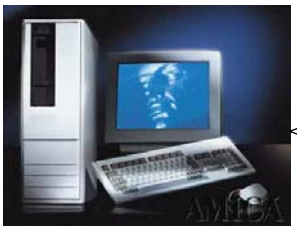
Some Areas Of Study

- 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/

Human-Computer Interaction

- Considers how people work with and use computers

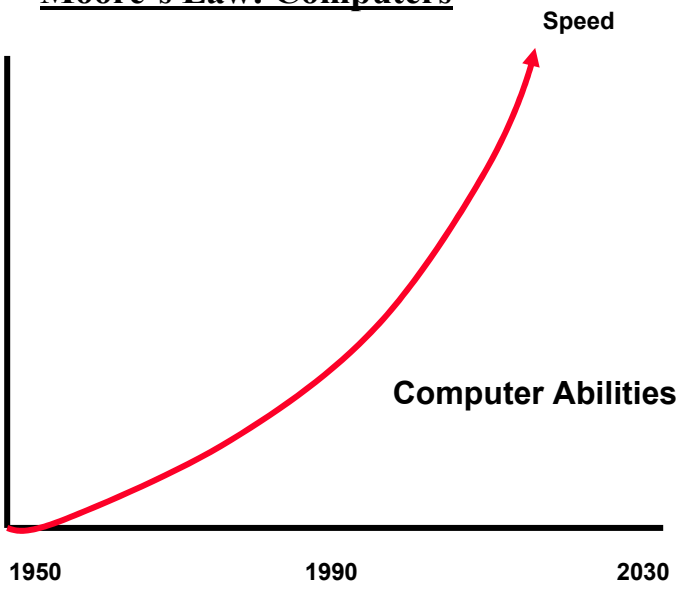


Technological perspective

Human perspective

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

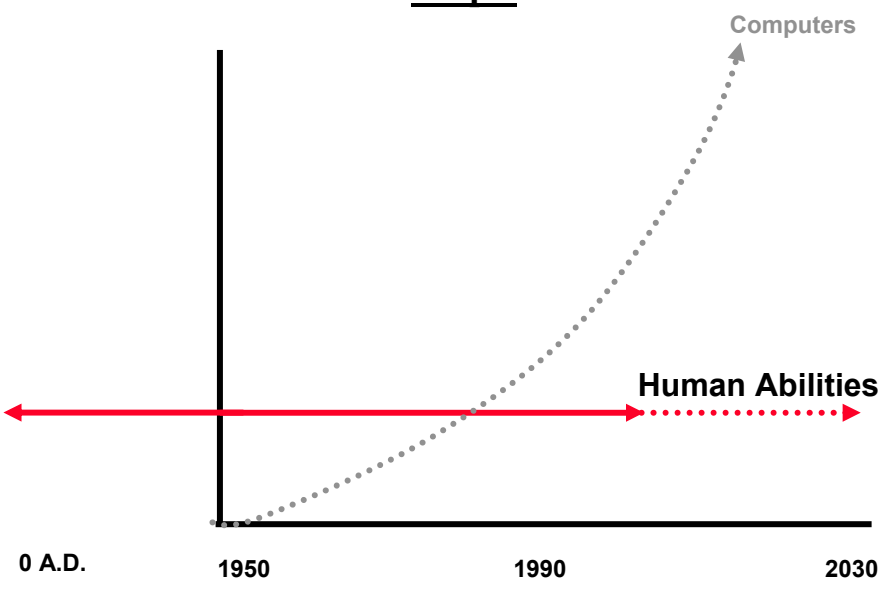
Moore's Law: Computers



These graphs are variations of those presented by Bill Buxton

James Tam

People

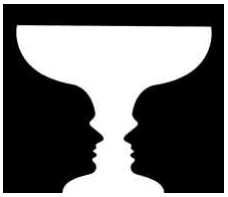


These graphs are variations of those presented by Bill Buxton

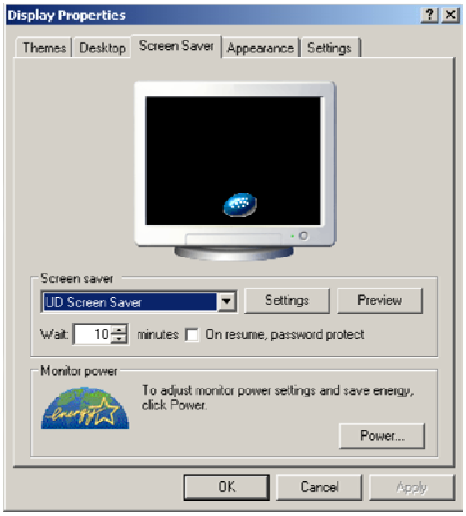
James Tam

Human Perspective: Issues

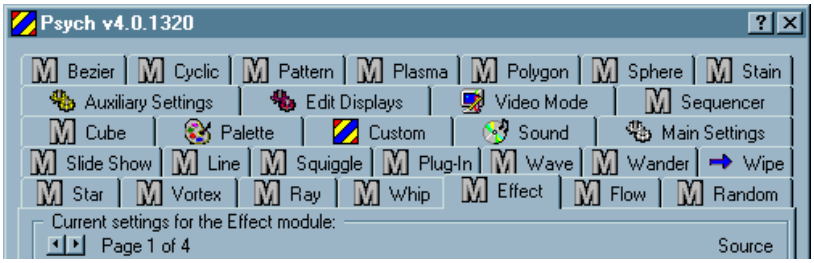
- How people process information
- Memory, perception, motor skills, attention etc.
- Language, communication and interaction



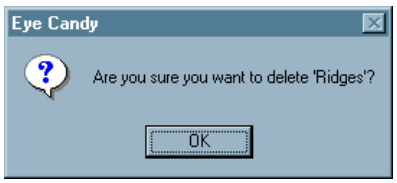
Human-Computer Interaction: Not Just Common Sense Information

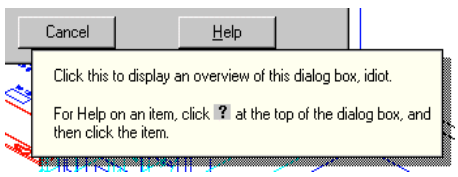


Human-Computer Interaction: Not Just Common Sense Information (2)



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





AutoCAD Mechanical

Computer Graphics

•Concerned with producing images on the computer.

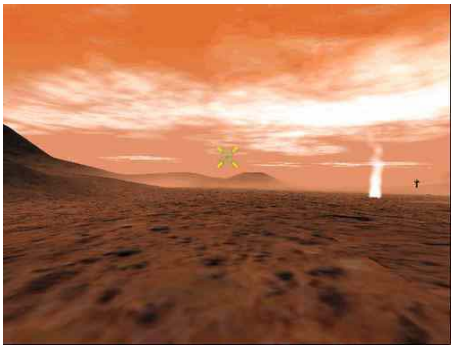
Scene from MechWarrior 4: Vengeance © Microsoft

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

Computer Graphics: Issues

•How to make the images look "real"?

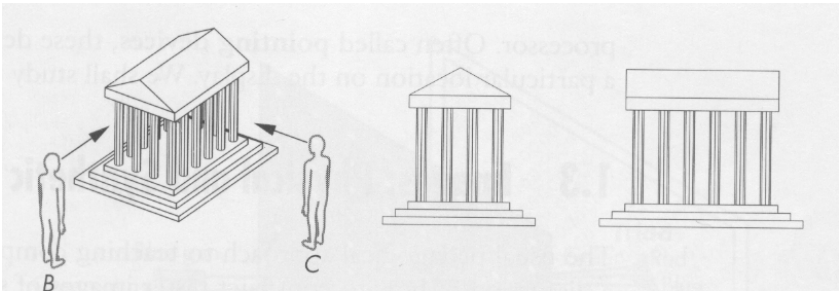
From http://klamath.stanford.edu/~aaa/



From ACM SIGGRAPH: Vol.32 No.2 May 1998

Computer Graphics: Highly Mathematical

•Highly mathematical



Computer Graphics: Still A Long Way To Go

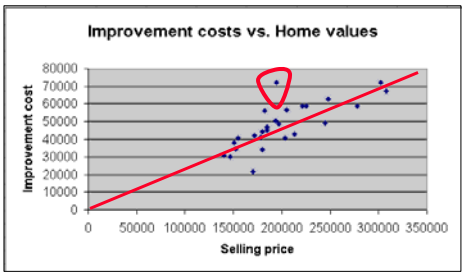
•"Even though modeling and rendering in computer graphics have been improved tremendously in the past 35 years, we are still not at the point where we can model automatically, a tiger swimming in the river in all it's glorious details." [1]

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

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

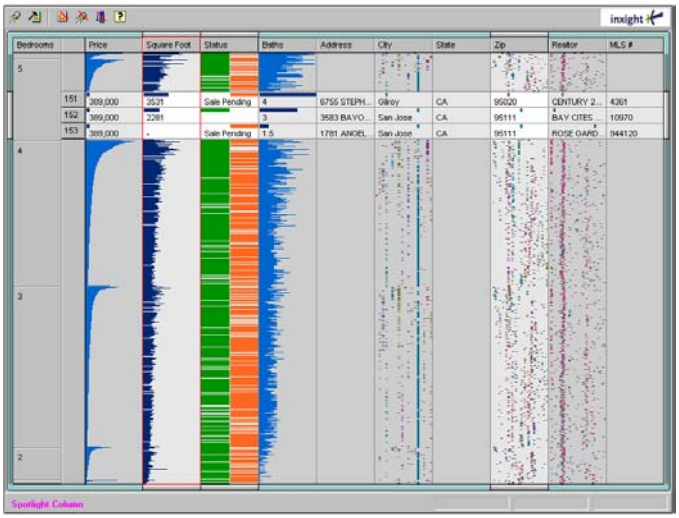


For more information: http://innovis.cpsc.ucalgary.ca/

James Tam

Information Visualization: Issues

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

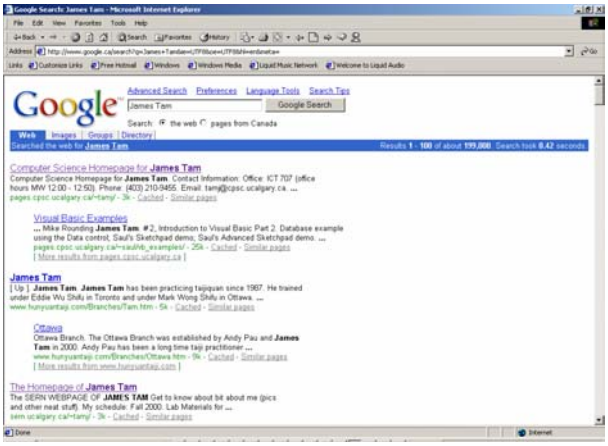


The Table Lens: Ramana R. and Stuart K. Card Xerox Palo Alto Research Center

James Tam

Databases

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



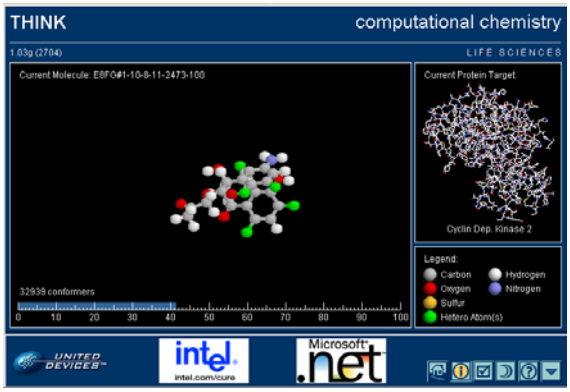
For more information: http://www.adsa.cpsc.ucalgary.ca/

Databases (2)

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

Computer Theory

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

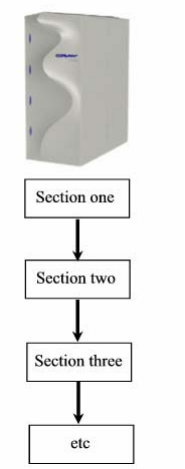


THINK © United Devices Inc. is part of a distributed Cancer research project.
For more information go to http://www.ud.com

James Tam

Computer Theory: Distributed Computing

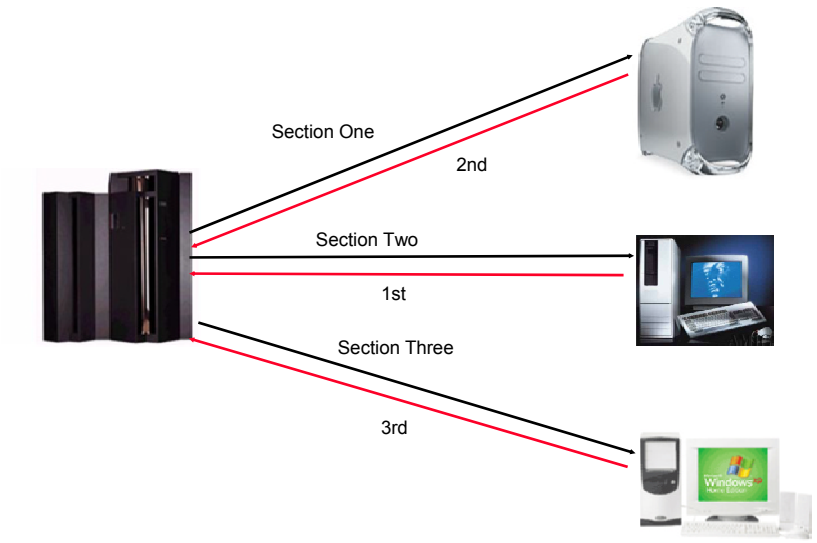
•One issue: Ensuring proper order



For more information: http://pages.cpsc.ucalgary.ca/~higham/Research/research.php

James Tam

Computer Theory: Distributed Computing (2)



James Tam

Computer Theory: Computer Security

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

Original information

Encrypted data

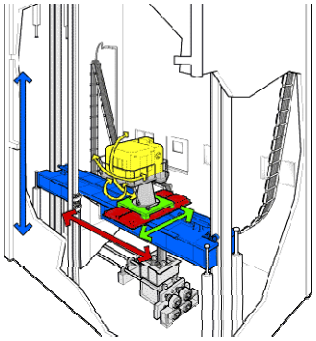
J~:>^@^@^@.^@9
^@^P^@^Y^G^@^
Z
^@^B^@^Y
^@^B^@^[
^@^B^@^

For more information: http://cisac.math.ucalgary.ca/

James Tam

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.ucalgary.ca/

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

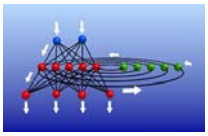
- What makes a person smart?
- How do we build a smart machine?
  - How to make a machine think like a person?
  - How to make a machine behave like a person?

For more information: http://pages.cpsc.ucalgary.ca/~jacob/AI/

Artificial Intelligence (2)

- Approaches:
  1) Top-down

  2) Bottom-up

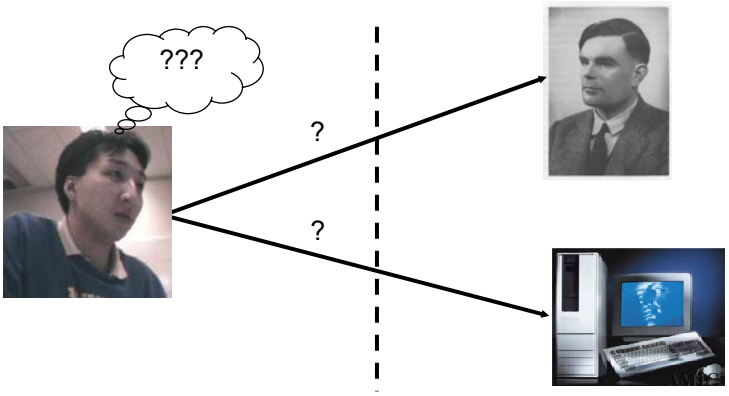


Images of the M1A and the neural network from the Pacific Northwest National Laboratory

James Tam

Artificial Intelligence (3)

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



James Tam

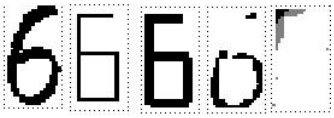
Artificial Intelligence (4)

- 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?

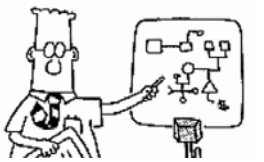


- Issues: What are the consequences of the computer misrecognizing something?

For more information: http://pages.cpsc.ucalgary.ca/~parker/

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

James Tam

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

James Tam