Introduction To CPSC 231 And To Computer Science

James Tam

Administrative (James Tam)

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- Office hours
  - Office hours: MT 15:00 – 16:00
  - Email: (any time)
  - Appointment: email, 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
- 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"

How To Succeed

•Successful people

Leonardo da Vinci

Amadeus Mozart

Bruce Lee

J.R.R. Tolkien

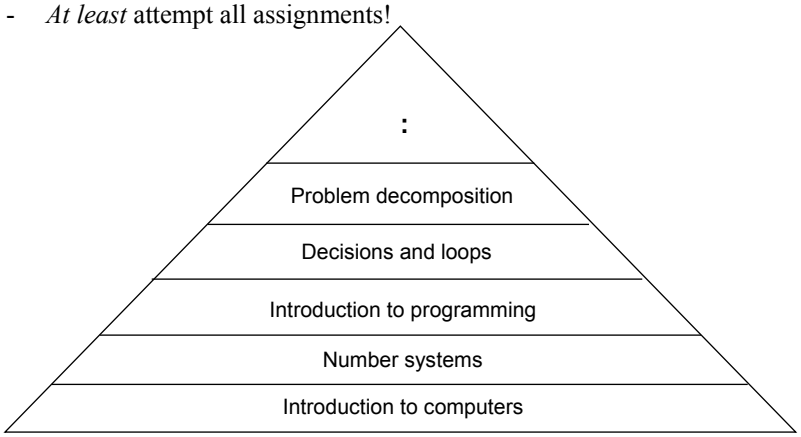
Wayne Gretzky

How To Suceed In This Course

1. Practice things yourself.
   - Write lots programs
     - At the *very least* attempt every assignment
     - Try to do some additional practice work (some examples will be given in class, some practice assignments will be available on the course web page).
   - Trace lots of code
     - Reading through programs that other people have written and understanding how and why it works the way that it does

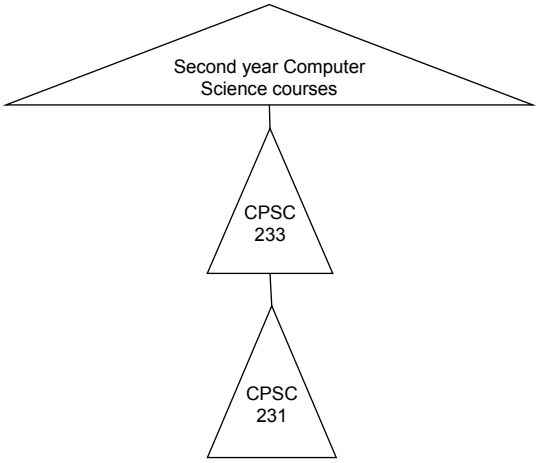
How To Succeed In This Course (2)

2. Make sure that you keep up with the material
   - Many of the concepts taught later depend upon your knowledge of earlier concepts.
   - Don't let yourself fall behind!
   - *At least* attempt all assignments!



How To Succeed In Computer Science

- The material in this course is used as a foundation for material in later courses
  - You need to understand be able to apply this material



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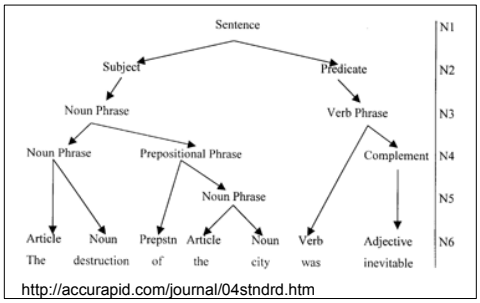
You Will Learn Programming Principles

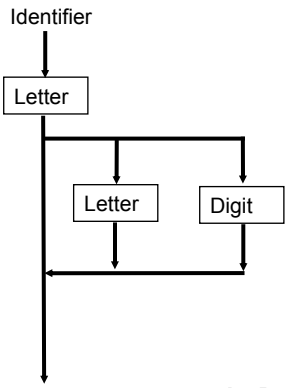
- The required structure for a computer program
- You will then need to apply these principles throughout the term

Learning the rules of the English language: grammar



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

Learning the rules of the computer language: syntax



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You Will Learn About Programming Style

- Learning good programming practices
- Learning why something is regarded as 'good' or 'bad' style

Bad ☹

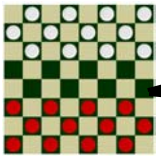
```
program p;
var
  x : integer;
  y : integer;
begin
  while (true) do
  begin
    if (x < 0) then
      break;
      :
  end;
end.
```

Good ☺ (or at least better)

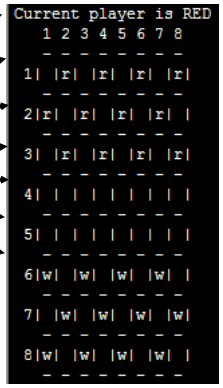
```
(*
   This program is a simple interest
    calculator
*)
program banking;
begin
  var interest      : real;
  var principle     : real;
  var amount        : real;
  var time          : real;
  amount := principle * rate * time;
       :
end.
```


You Will Learn How To Problem Solve

- With a knowledge of programming practices and programming style you will work out solutions to given problems (e.g., assignments).

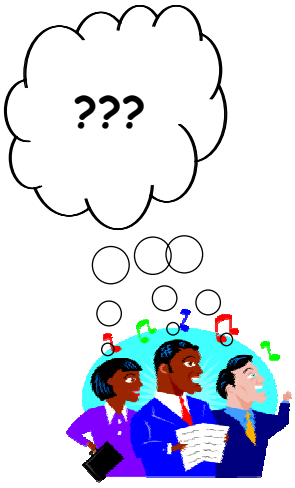


Assignment: create a computerized checkers game (western version).



Solution: A text-based Pascal program.

Feedback



Dilbert © United Features Syndicate

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How You Will Be Evaluated

- Assignments (*Total value 30%*)
- Exams (*Total value 70%*)
  - Midterm exam (25%): In class during normal lecture time
  - Final exam (45%): 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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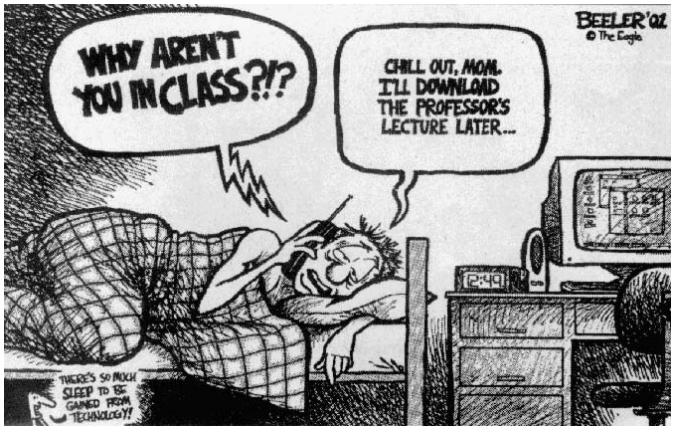
Course Resources

- Course website: http://pages.cpsc.ucalgary.ca/~tamj/231
- Course directory: /home/231/tamj (accessed via your UNIX Computer Science account)
- Recommended course textbook:
  - Pascal Programming & Problem Solving, 4th Edition, Leestma/Nyhoff (Prentice Hall)

How To Use The Course Resources

- They are provided to support and supplement this class.
- Neither the course notes nor the text book 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

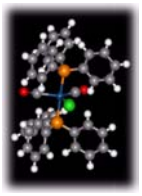
•What is Computer Science?

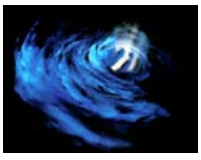
Introduction To Computer Science

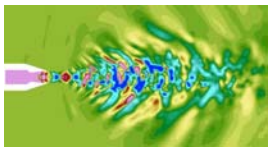
•What is Computer Science?

Introduction To Computer Science

•Computer Science is about problem solving







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

Some Areas Of Study And Research In Computer Science

- Human-Computer Interaction
- Computer Graphics
- Information Visualization
- Databases
- Computer theory
- Computer networking and distributed systems
- 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 udpated list: http://www.cpsc.ucalgary.ca/Research/

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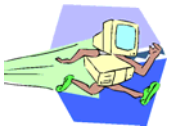
Human-Computer Interaction (HCI)

- Most of Computer Science deals with the 'technical' side of computers.



Run computers faster!

Make computers store more information!!

Increase the networking capabilities of computers!!!

- These technical issues (and others) are all very important but something is still missing...

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

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Human-**Computer** Interaction

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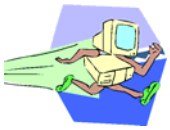

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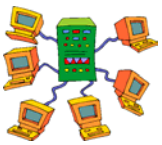

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Human-Computer Interaction

- ...but don't forget about the other side of the relationship.
- No matter how powerful the computer and how well written is the software, if the user of the program can't figure out how it works then the system is useless.
- Software should be written to make it as easy as possible for the user to complete their task. (Don't make it any harder than it has to be).
- This is just common sense and should/is always taken into account when writing software?

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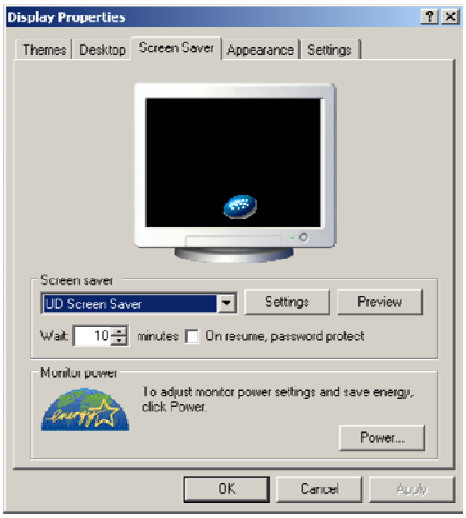
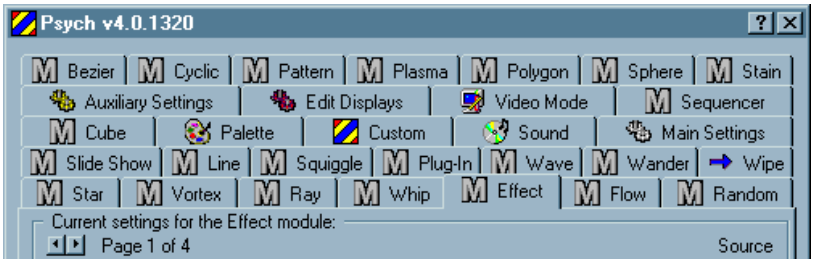
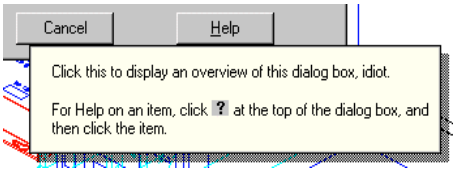
Human-Computer Interaction: Not Just Common Sense Information



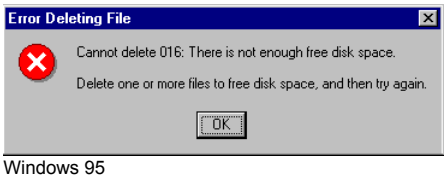
Human-Computer Interaction: Not Just Common Sense Information (2)



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



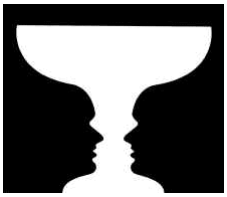
AutoCAD Mechanical



Windows 95

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.

Madden Football © Electronic Arts

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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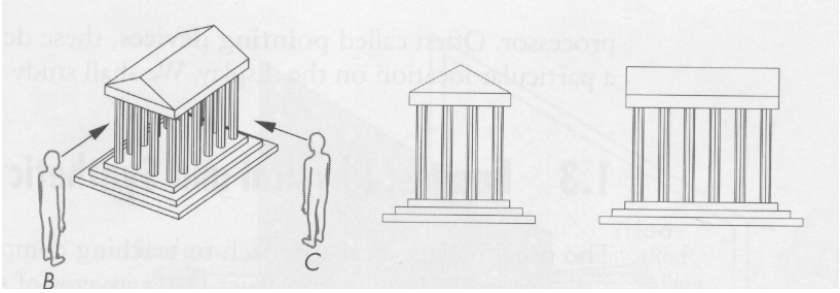
Computer Graphics: Highly Mathematical

•Highly mathematical



Computer Graphics: Still A Long Way To Go

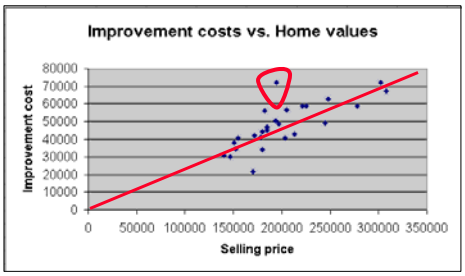
•"Even though modeling and rendering in computer graphics have been improved tremendously in the past 35 years, we are still not at the point where we can model automatically, a tiger swimming in the river in all it's glorious details." [1]

[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/

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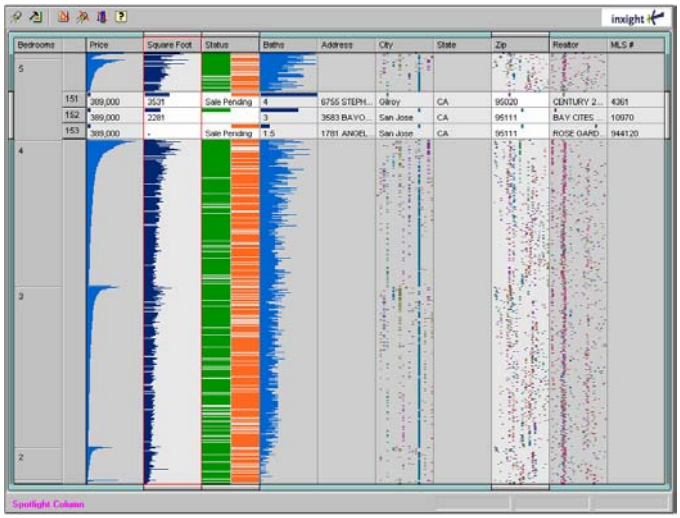
Information Visualization: Issues

•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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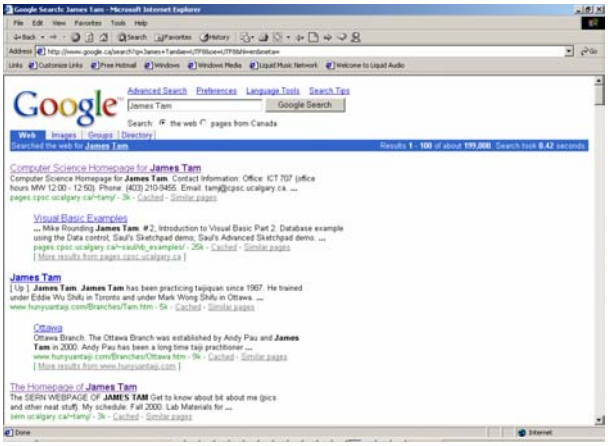
Databases

- 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/

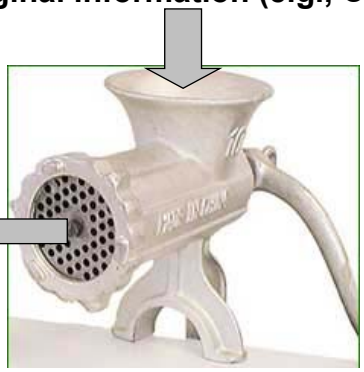
Databases (2)

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

Computer Theory (e.g., Computer Security)

- Computer theory: studies problems that are mathematical but are to be solved with a computer.
- 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/

Computer Networking And Distributed Systems

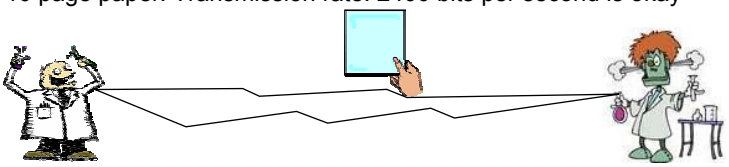
- The advantages of working remotely (through a network or the Internet) are so obvious that it's now all taken for granted.

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

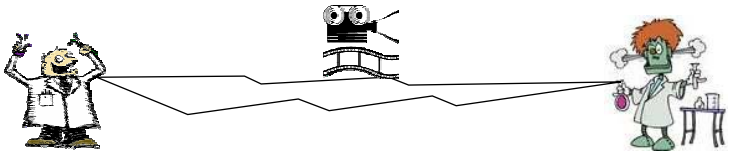
Computer Networking And Distributed Systems (2)

•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

Computer Networking And Distributed Systems (3)

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

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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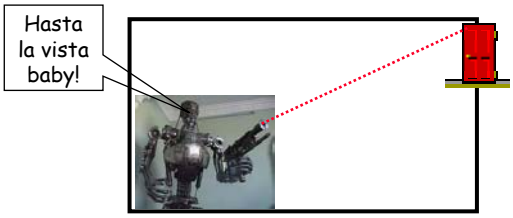
Artificial Intelligence (2)

- Approaches:
  1) Trying to simulate a person



  2) Trying to simulate what the person can do

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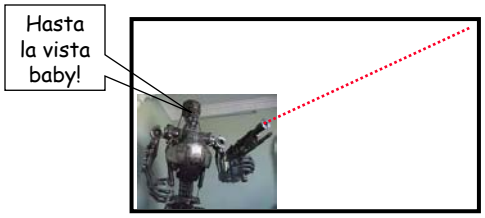
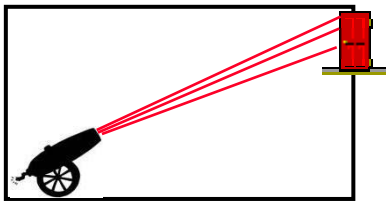
Artificial Intelligence (2)

- Approaches:
  1) Trying to simulate a person

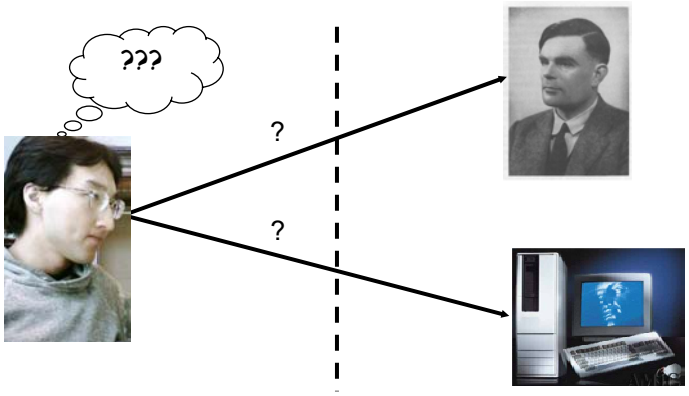


  2) Trying to simulate what the person can do



Artificial Intelligence (3)

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



Artificial Intelligence (4)

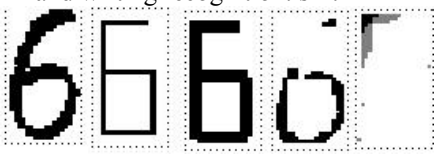
•Much work still needs to be done

Photo from www.startrek.com © Paramount

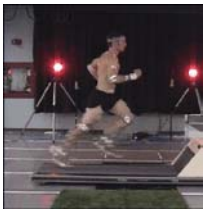
Computer Vision

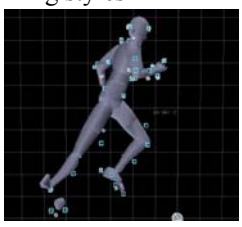
•Determining what an object is based on it's visual appearance

- Hand writing recognition: six?



- Analyzing digital video: studying running styles





For more information: http://pages.cpsc.ucalgary.ca/~parker/DML/welcome.html or http://vma.cpsc.ucalgary.ca/projects

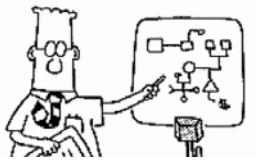
Computer Vision (2)

- Some Issues:
  - When is it okay and not okay to capture computer images and videos?

  - 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

For more information: http://sern.ucalgary.ca/

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!!! >>

Silent Hill 3 © Konami

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