


Introduction To CPSC 231 And To Computer Science

James Tam

James Tam

Administrative (James Tam)

- Contact Information
 - Office: ICT 707 
 - Email: tamj@cpsc.ucalgary.ca
- Office hours
 - Office hours: MT 15:00 – 16:00 (Right after class)
 - Email: (any time)
 - Appointment: email, phone or call
 - Drop by for urgent requests (but no guarantee that I will be in if it's outside of my office hours!)



James Tam

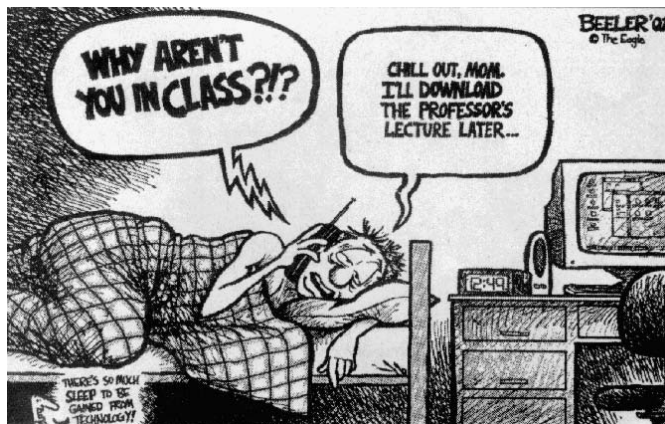
Course Resources

- 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)

James Tam

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.



James Tam

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;
end;
```

James Tam

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;
end;
```

*If you miss a class make
sure that you catch up on
what you missed (get
someone's class notes)*

*...when you do make it to
class make sure that you
supplement the slides with
your own notes (cause you
aint gonna remember it in
the exams if you don't)*

James Tam

But Once You've Made An Attempt To Catch Up

- Ask for help if you need it
- There are no dumb questions



Images from "The Simpsons" © Fox

James Tam

Is This The Course The One For You?

- Introductory Computer Science courses for non-Computer Science majors (*do not want to get a Computer Science degree*)
 - CPSC 203
 - CPSC 215 (soon to be CPSC 217)
- The introductory Computer Science course for Computer Science majors (*do wish to get a Computer Science degree*)
 - CPSC 231

James Tam

CPSC 203

- The focus is on how to *use* computer programs.
- One important objective is to learn how computers and technology works *from the user's perspective*
 - Issues related to how computers work are largely introduced in the context of using applications.
 - E.g., Why is my computer so slow when I'm editing my movies?
 - E.g., Why did that computer game look and sound so much better on the store computer than on my machine at home?
- Assignments involve *using* popular software:
 - Productivity (business) software: MS-Office
 - Fun software: building a web site, making a computerized video etc.

James Tam

CPSC 215/217

- An introduction to *writing* computer programs.
- This course is designed for students whose major is not Computer Science
 - This person will not get a degree in Computer Science
 - This person will not develop/write software for a living (become a programmer)
 - This person may work with complex specialized software (e.g., running a biological simulation) which may require customization
- One important objective is to learn how computers and technology works *from the programmer's perspective*
 - Issues related to how computers work are largely introduced in the context of creating applications.
 - E.g., If I write my program one way it will run faster than if I write it another way.
- Assignments involve *writing* simple programs:
 - Possible examples:
 - Displaying text onscreen
 - Saving and reading information to/from a file

James Tam

CPSC 231

- An introduction to *writing* computer programs.
- The course is designed specifically for Computer Science majors
 - This person will get a degree in Computer Science
 - This person will likely develop/write software for a living (become a programmer)
- Typically the course is more in-depth and cover more topics than CPSC 215/217.
- One important objective is to learn how computers and technology works *from the programmer's perspective*
 - Issues related to how computers work are largely introduced in the context of creating applications.
 - E.g., What kind of game can I write given the strengths and weaknesses of the PS3 vs. the Xbox 360 vs. the Wii?
- This may result in having more challenging assignments than the ones in CPSC 215/217.

James Tam

A Bit More 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:
 - Almost all students do not have previous experience
 - Most students do get through the course
- It can be a lot of work



How To Succeed

•Successful people



Leonardo da Vinci



Bruce Lee



J.R.R. Tolkien



Amadeus Mozart



Wayne Gretzky

James Tam

How To Succeed 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

James Tam

How To Succeed In This Course (4)

4. Start working on things as early as possible:
 - Don't cram the material just before the exam, instead you should be studying the concepts as you learn them throughout the term.
 - Don't start assignments the night (or day!) that they are due, they may take more time than you might first think so start as soon as possible.

James Tam

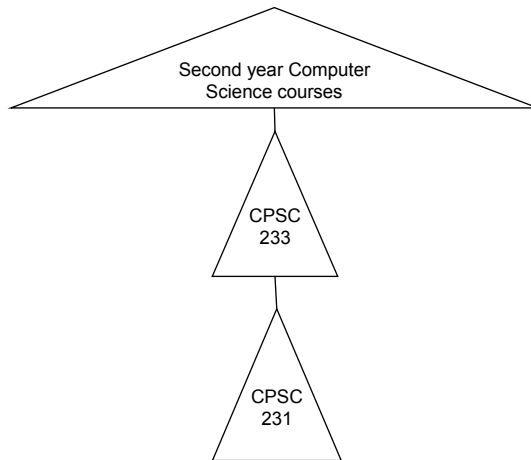
How To Succeed In This Course: A Summary

1. Practice things yourself
2. Make sure that you keep up with the material
3. Look at the material before coming to lecture
4. Start working on things early

James Tam

How To Succeed In Computer Science: Additional Note For Computer Science Majors

- The material in this course is used as a foundation for material in later courses
 - It will be assumed in the subsequent classes that you already know the material in this class.

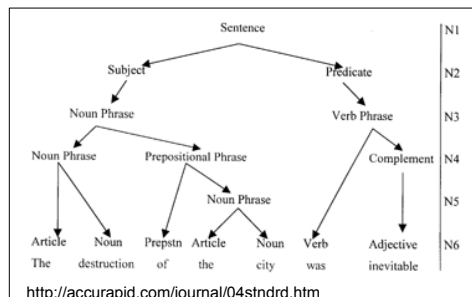


James Tam

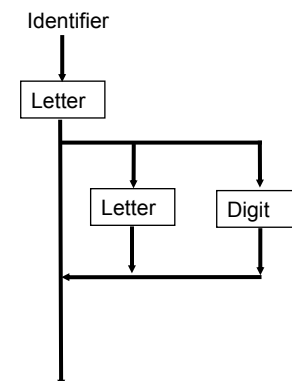
You Will Learn About Program Structure

- The required structure and rules for creating a computer program (*the syntax of the language*)
- 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



James Tam

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.
```

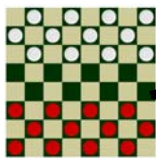
Good ☺ (or at least better)

```
(*  
  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.
```

James Tam

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).



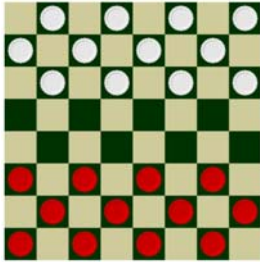
Assignment: create a computerized checkers game (western version).

```
Current player is RED  
 1 2 3 4 5 6 7 8  
- - - - -  
1| r| r| r| r| r|  
- - - - -  
2|r| r| r| r| r| |  
- - - - -  
3| r| r| r| r| r|  
- - - - -  
4| | | | | | | |  
- - - - -  
5| | | | | | | |  
- - - - -  
6| w| w| w| w| w| |  
- - - - -  
7| w| w| w| w| w| |  
- - - - -  
8| w| w| w| w| w| |  
- - - - -
```

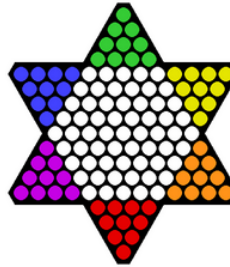
Solution: A text-based Pascal program.

James Tam

Problem Solving Is A Skill That You Need To Learn And To Improve Upon



Your assignment:
Implement a checkers
game that follows
European rules



Lecture example: A
partial implementation of
the Chinese Checkers
game

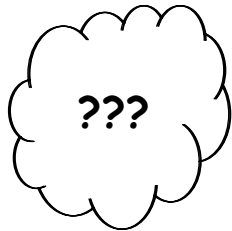
James Tam

The Problems Are Not Impossible For Beginners (They Just Seem That Way At First :p)

The Game of Life	
European checkers	
The Quest for the Fountain of Fulfillment	
Star Trek, mission: Find the dilithium and save the earth	
The Lord of The Rings: Quest to Mount Doom	
Star Wars: The Assault on the Death Star	
The Lord of The Rings: The Journey Through Khazad-dum	
The Hobbit	
Squirt the weed!	

James Tam

Feedback



Dilbert © United Features Syndicate

James Tam

Introduction To Computer Science

- What is Computer Science?



James Tam

Introduction To Computer Science

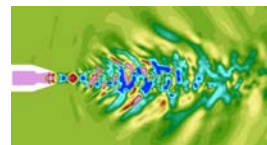
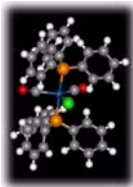
- What is Computer Science?



James Tam

Introduction To Computer Science

- Computer Science is about problem solving



Some Areas Of Study And Research In Computer Science

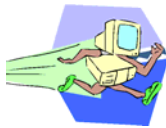
- Human-Computer Interaction
- Computer Graphics
- Information Visualization
- Databases
- Computer theory
- Computer networking and distributed systems
- Artificial Intelligence
- Computer Vision
- Software Engineering
- Games programming

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

James Tam

Human-Computer Interaction (HCI)

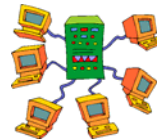
- Most of Computer Science deals with the ‘technical’ side of computers.



Run computers faster!



Make computers store
more information!!



Increase the
networking capabilities
of computers!!!

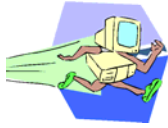
- These technical issues (and others) are all very important but something is still missing...

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

James Tam

Human-Computer Interaction

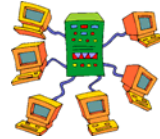
- Most of Computer Science deals with the ‘technical’ side of computers.



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://groupiab.cpsc.ucalgary.ca/> or <http://pages.cpsc.ucalgary.ca/~ehud/Research.html>

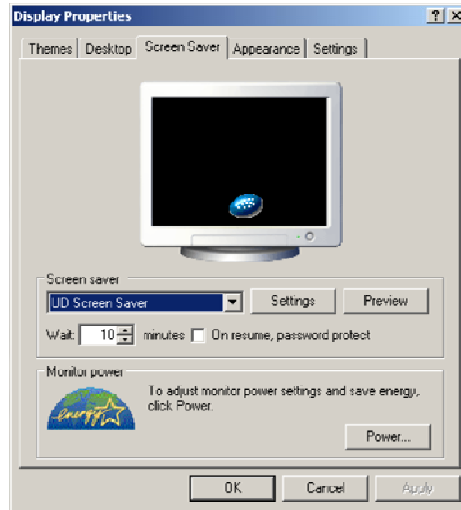
James Tam

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?

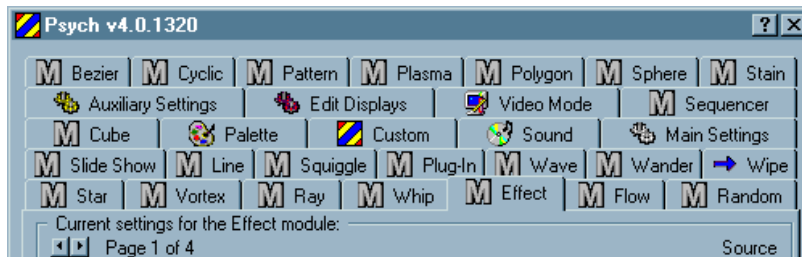
James Tam

Human-Computer Interaction: Not Just Common Sense Information



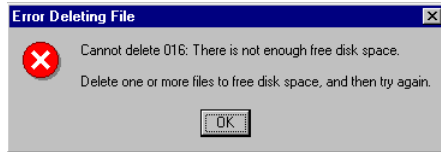
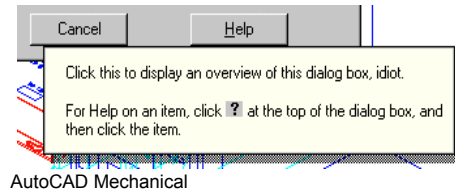
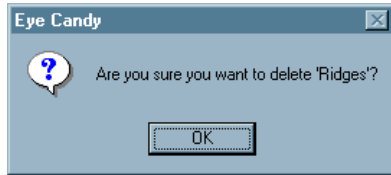
James Tam

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



James Tam

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

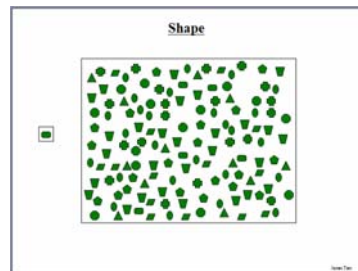
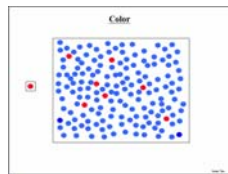
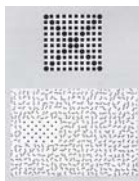


Windows 95

James Tam

Human Perspective: Some Of The Issues

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



James Tam

Human Perspective: Some Of The Issues (2)



James Tam

Computer Graphics

- Concerned with producing images on the computer.



Madden Football © Electronic Arts

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

James Tam

Computer Graphics: Issues

- How to make the images look “real”?



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

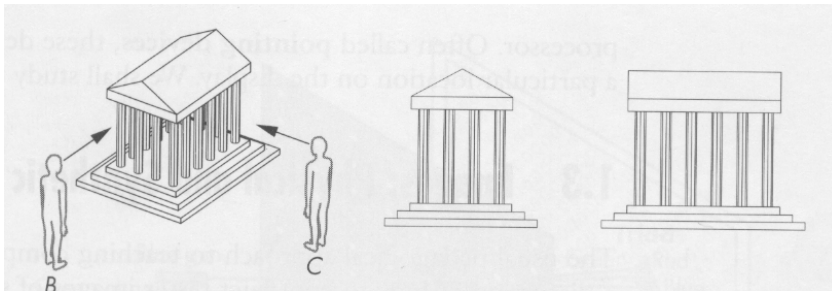


Final Fantasy: The spirits within © 2001 - Columbia Pictures

James Tam

Computer Graphics: Highly Mathematical

- Highly mathematical



James Tam

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



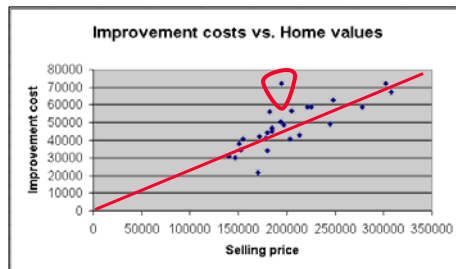
¹ From “The Tiger Experience” by Alain Fournier at the University of British Columbia

James Tam

Information Visualization

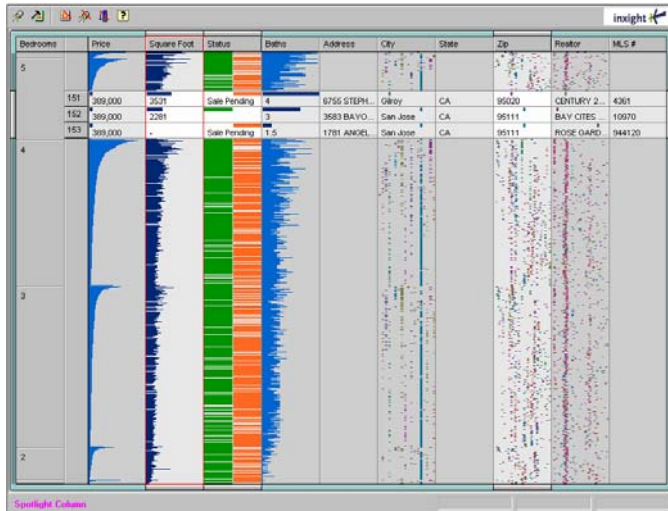
- Finding ways of representing information in a way that amplifies cognition.

	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



Information Visualization: Issues

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

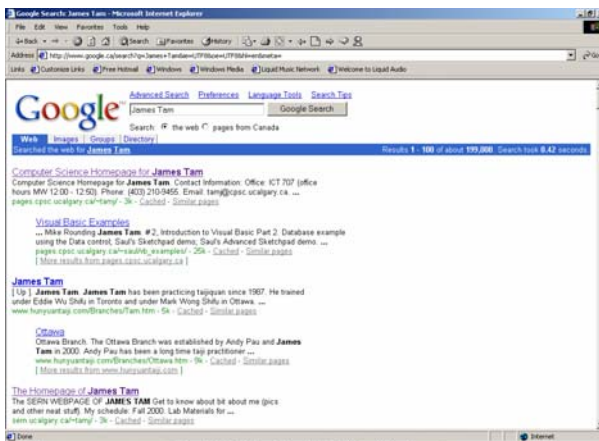


The Table Lens: Ramana R. and Stuart K. Card Xerox Palo Alto Research Center

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/>

James Tam

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.

James Tam

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/>

James Tam

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.



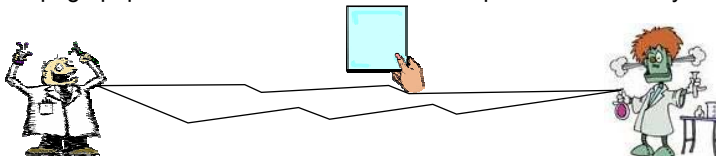
For more information: <http://grid.ualgary.ca/>, <http://www.westgrid.ca/> or <http://pages.cpsc.ualgary.ca/~mahanti/>

James Tam

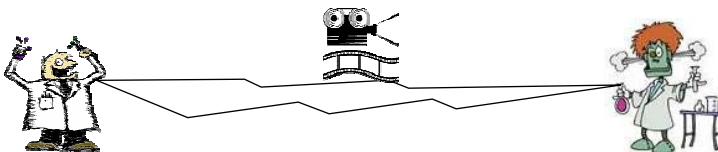
Computer Networking And Distributed Systems (2)

- 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



James Tam

Computer Networking And Distributed Systems (3)

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



Terminator 2: Judgment Day © Lions Gate Home Entertainment

James Tam

Computer Networking And Distributed Systems (3)

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



James Tam

Computer Networking And Distributed Systems (3)

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



James Tam

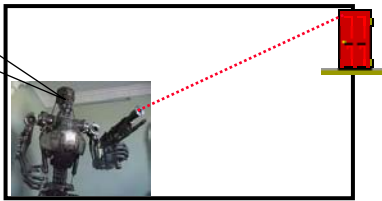
Artificial Intelligence

- 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) Trying to simulate a person

Hasta la vista baby!

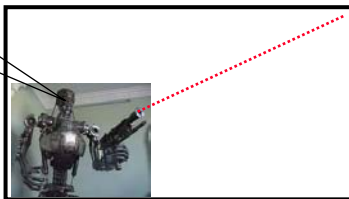


- 2) Trying to simulate what the person can do

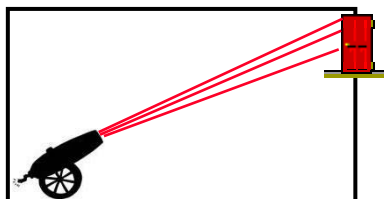
Artificial Intelligence (2)

- Approaches:
 - 1) Trying to simulate a person

Hasta la vista baby!

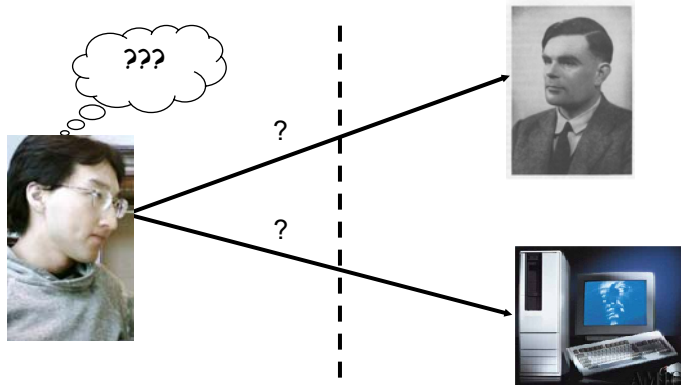


- 2) Trying to simulate what the person can do



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

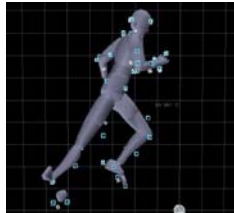
James Tam

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>

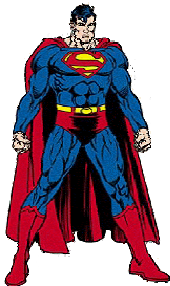
James Tam

Computer Vision (2)

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



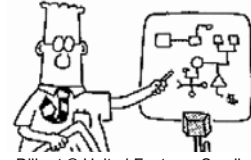
- What are the consequences of the computer misrecognizing something?



James Tam

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/>

James Tam

Games Programming

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



Silent Hill 3 © Konami

<< Warning!!! >>

Blatant
advertisement

<< Warning!!! >>

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

James Tam