



Computer Science: Perspiration Or Inspiration?



**Presented by:
James Tam**

James Tam

Who Is The Bozo In Front Of You?

- Working as a full time faculty member since 2001.
- Taught a variety of Computer Science courses:
 - CPSC 001
 - CPSC 203
 - CPSC 231
 - CPSC 233
 - CPSC 235
 - CPSC 331
 - CPSC 481



James Tam

Outline Of Today's Talk

- What is Computer Science?
- What does this mean for me? (Perspiration)
- An overview of some of the areas in Computer Science (Inspiration)
- Details about three areas in Computer Science
 - Human-Computer Interaction
 - Artificial Intelligence
 - Computer Vision
- Conclusions and wrap up

These slides can be found under the following urls:

Acrobat: <http://www.cpsc.ucalgary.ca/~tamj/2006/springTalk.pdf>

PowerPoint: <http://www.cpsc.ucalgary.ca/~tamj/2006/springTalk.ppt>

James Tam

What Is Computer Science?



James Tam

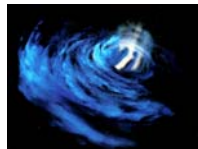
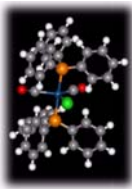
What Is Computer Science?



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What Is Computer Science?

- Computer Science is about problem solving

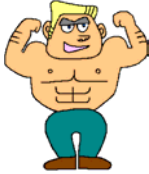


Some of the picture sources include: Star Trek: Deep space 9 © Paramount & the international space station

James Tam

What Is Computer Science?

- A very 'hands-on' discipline



- You get better at it by doing things for yourself
 - Writing lots of programs.
 - Reading lots of programs.

James Tam

What Is Computer Science?

- But what does this mean to me (a student in a Computer Science class)?
- Perspiration! (It can be a lot of work)



Wav file from "The Simpsons"

James Tam

Some Areas Of Study And Research In Computer Science

- Human-Computer Interaction
 - <http://grouplab.cpsc.ucalgary.ca/>
 - <http://pages.cpsc.ucalgary.ca/~ehud/Research.html>
- Computer Graphics
 - <http://jungle.cpsc.ucalgary.ca/>
- Information Visualization
 - <http://innovis.cpsc.ucalgary.ca/>
- Databases
 - <http://www.adsa.cpsc.ucalgary.ca/>
- Computer theory
 - <http://pages.cpsc.ucalgary.ca/~higham/Research/research.php>
 - <http://www.cpsc.ucalgary.ca/Research/qcc.php/>

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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Some Areas Of Study And Research In Computer Science (2)

- Computer networking and distributed systems
 - <http://grid.ucalgary.ca/>
 - <http://www.westgrid.ca>
 - <http://pages.cpsc.ucalgary.ca/~mahanti>
- Simulations
 - <http://warp.cpsc.ucalgary.ca/>
- Artificial Intelligence
 - <http://pages.cpsc.ucalgary.ca/~jacob/AI/>
 - <http://pages.cpsc.ucalgary.ca/~denzinge/>
 - <http://pages.cpsc.ucalgary.ca/~kremer/>
- Computer Vision
 - <http://pages.cpsc.ucalgary.ca/~parker/DML/welcome.html>
 - <http://vma.cpsc.ucalgary.ca/>

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Some Areas Of Study And Research In Computer Science (3)

- Software Engineering
 - <http://sern.ucalgary.ca/>
- Games programming
 - http://pages.cpsc.ucalgary.ca/~parker/cpsc585-radical/the_site_2/CPSC585.html

This list provides only a brief introduction to the different areas of Computer Science and is far from comprehensive:
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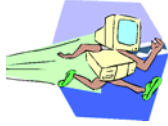
Areas Of Computer Science That I Will Talk About Today

- Human-Computer Interaction
- Artificial Intelligence
- Computer Vision
- (Extra bonus area?)

James Tam

Human-Computer Interaction (HCI)

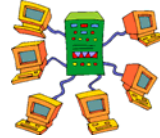
- Most of Computer Science deals with the ‘technical’ side of computers.



Run computers faster!



Make computers store more information!!



Increase the networking capabilities of computers!!!

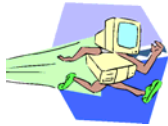
- These technical issues (and others) are all very important but something is still missing...

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

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Human-Computer Interaction

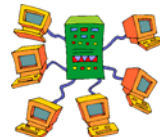
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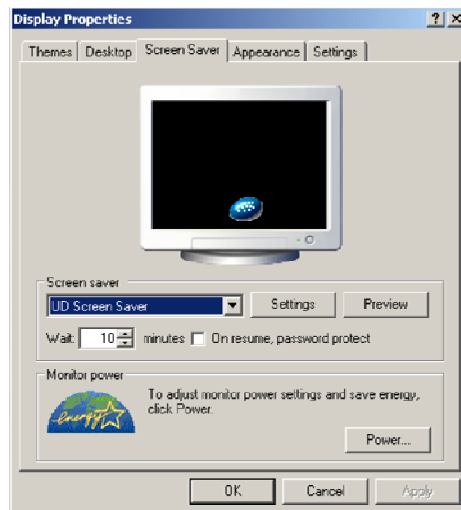
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Human-Computer Interaction

- ...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?

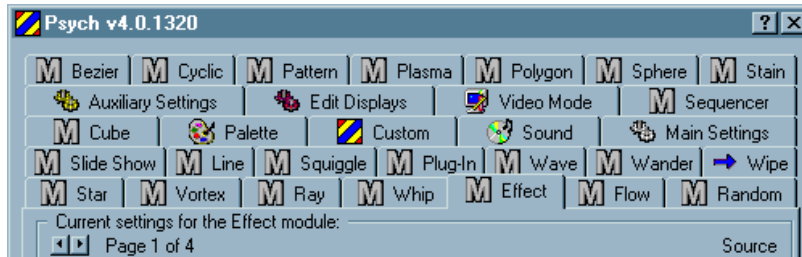
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Human-Computer Interaction: Not Just Common Sense Information



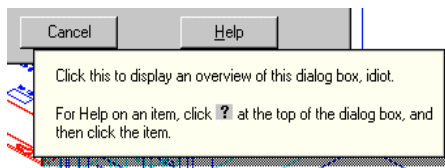
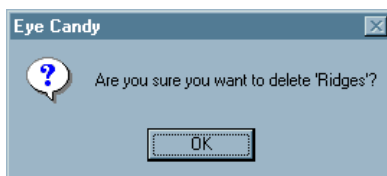
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Human-Computer Interaction: Not Just Common Sense Information (2)



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



AutoCAD Mechanical

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Human-Computer Interaction: An Actual Research Project

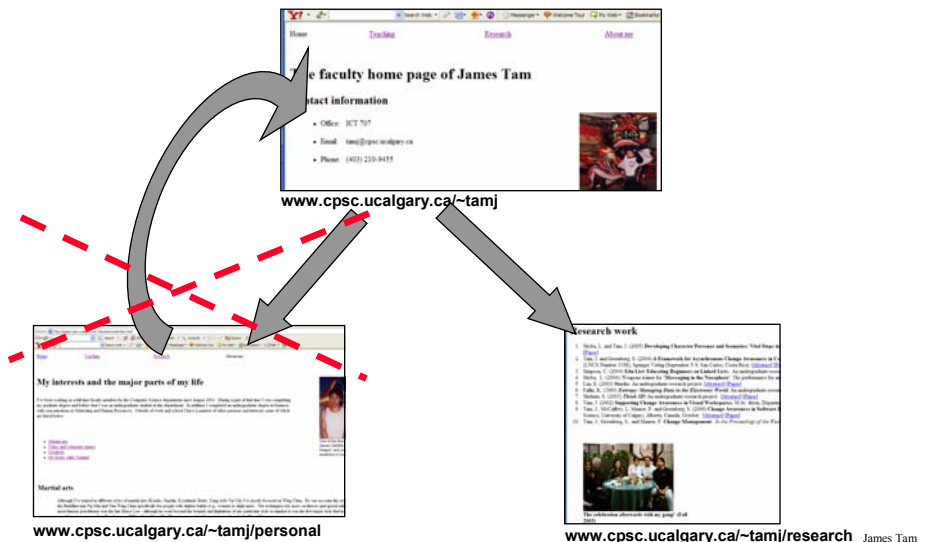
- It involved developing a toolbar for Internet Explorer.
- In a previous study it was found that 60% of the pages that are person visits are revisits.
- The recommendation was to make it as easy as possible for people to find pages that they visited previously.
- This was done by integrating the back button, bookmarks and the history system.
- The one part of the system that I will discuss is how the back button was modified to make it easier to revisit previously viewed pages.

For more information: <http://grouplab.cpsc.ucalgary.ca/papers/2001/01-Kaasten.MSc/kaasten-msc-01.pdf>

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An Actual Human-Computer Interaction Project

- The current approach used with Internet Explorer's back button.



www.cpsc.ucalgary.ca/~tamj/personal

www.cpsc.ucalgary.ca/~tamj/research James Tam

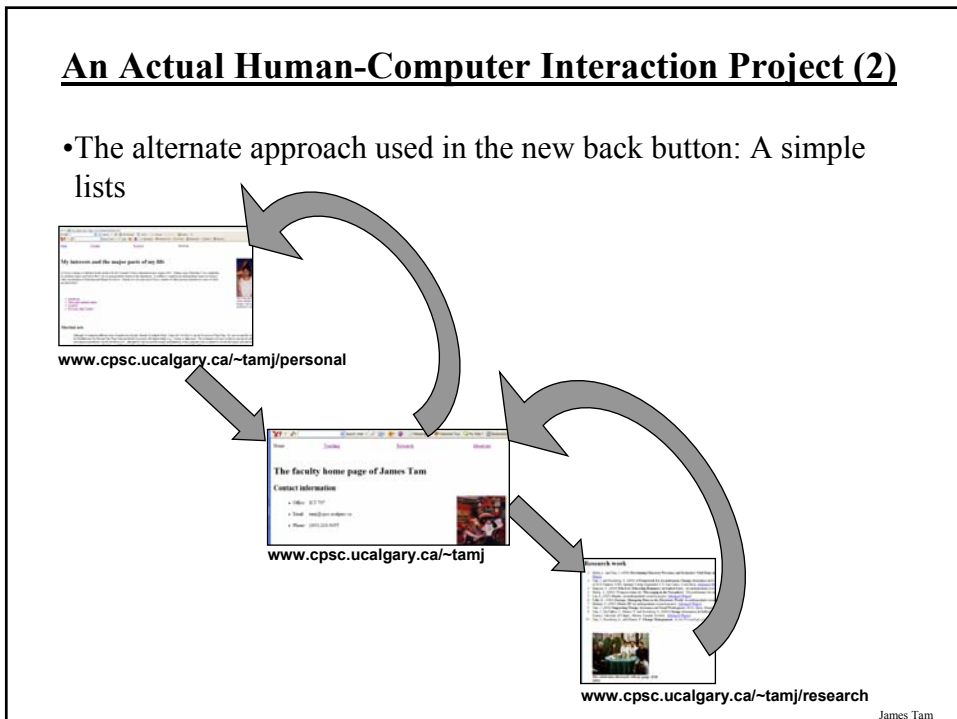
An Actual Human-Computer Interaction Project

- The current approach used with Internet Explorer's back button.



An Actual Human-Computer Interaction Project (2)

- The alternate approach used in the new back button: A simple lists



What Is Artificial Intelligence?

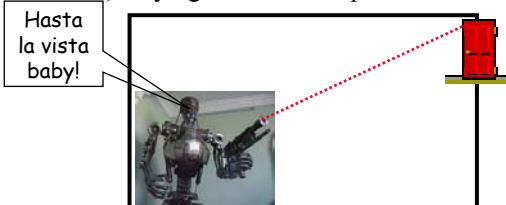
- What makes a person smart?
- How do we build a smart machine?
 - How to make a machine 'think' like a person?
 - How to make a machine behave like a person?

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

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Artificial Intelligence (2)

- Approaches:
 - 1) Trying to simulate a person



- 2) Trying to simulate what the person can do

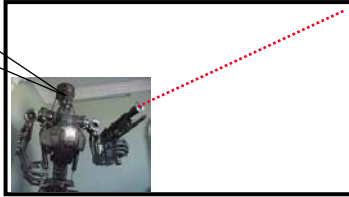
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Artificial Intelligence (2)

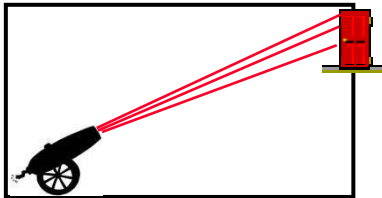
- Approaches:

1) Trying to simulate a person

Hasta
la vista
baby!



2) Trying to simulate what the person can do

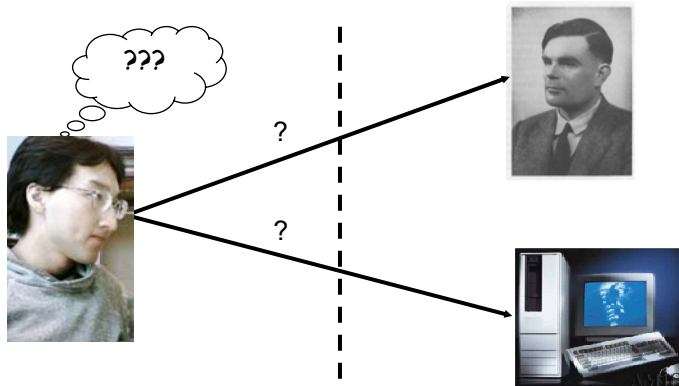


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Artificial Intelligence (3)

- 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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Artificial Intelligence: An Actual Project

- Many games have hidden “cheesy” ways that players can win
- e.g. Poker: if a player gets a pair of twos then the dealer will fold regardless of the hand that is held.
- This project involved testing the game FIFA-99 © Electronic Arts.



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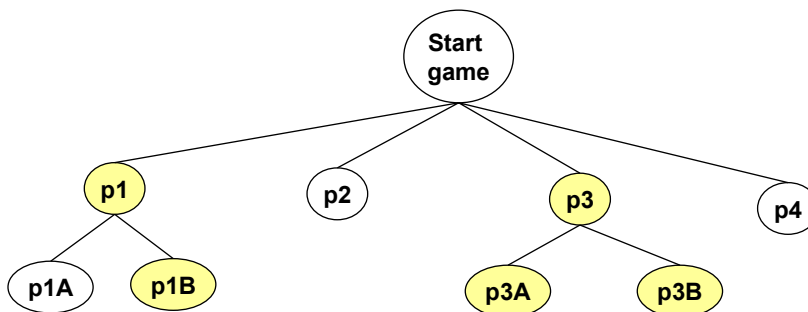
Artificial Intelligence: An Actual Project (2)

- With this game a lucky series of combinations by the human player may allow him or her to easily and repeatedly score goals on the team controlled by the computer controlled team.
- Using a person to attempt the entire possible set of combinations that may be attempted in the game isn't feasible.
- Even using a computer to try all the combinations will take too long.

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Artificial Intelligence: An Actual Project (3)

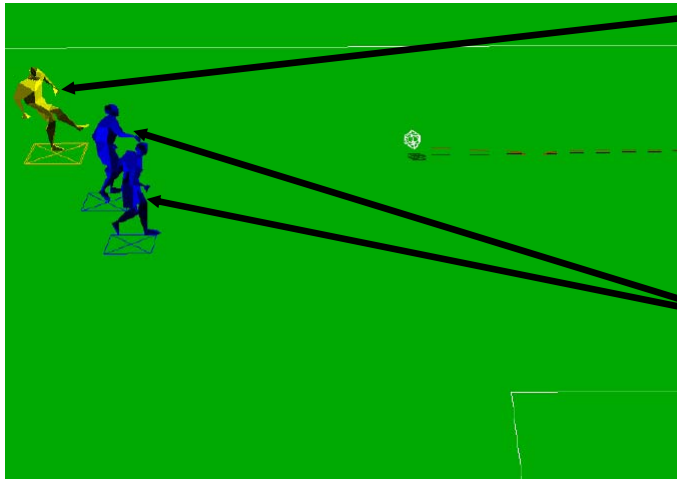
- A computer program that combined human intuition about “what might work” with the computing power of a computer was used instead.



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Artificial Intelligence: An Actual Project (4)

- One “cheesy” action sequence for scoring that was discovered by the computerized testing program.



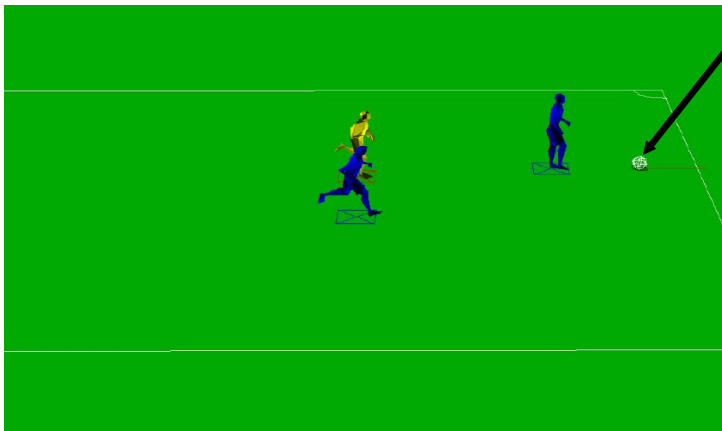
Player controlled by the testing program.

Players controlled by the FIFA-99 game

Player kicks ball towards the opposing goal line near the corner.

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Artificial Intelligence: An Actual Project (5)

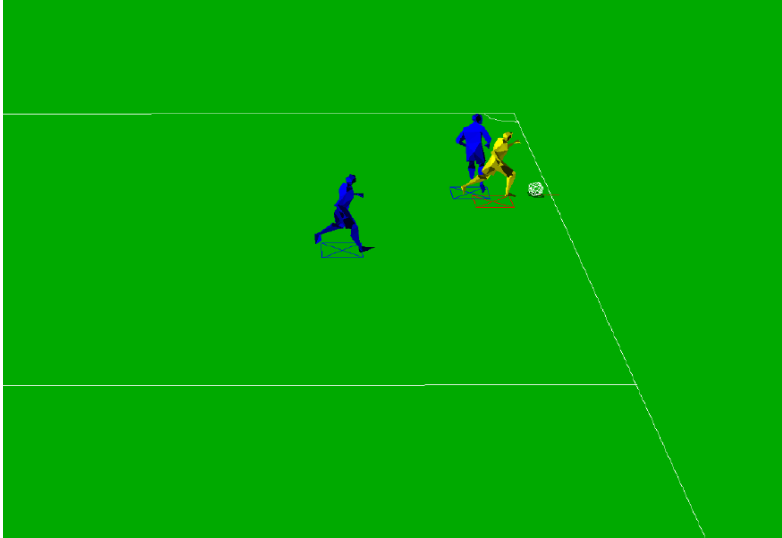


Ball appears to be going out of bounds.

All three players start out after the ball but because it appears to be going out of bounds one of FIFA-99's defensemen slows down.

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Artificial Intelligence: An Actual Project (6)



The player controlled by the testing program now steals the ball from the confused defenseman.

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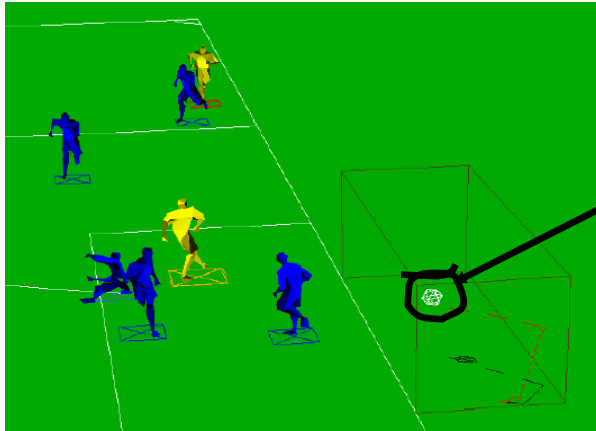
Artificial Intelligence: An Actual Project (7)



He shoots!

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Artificial Intelligence: An Actual Project (8)



The baffled defensemen and goalie (controlled by FIFA-99) cannot recover in time and the team controlled by the testing program scores a goal.

He scores! (On the corner kick)

James Tam

Artificial Intelligence: An Actual Project (9)

- While “sucker” combinations like this are possible in real life this technique was tested extensively.
- The team that was controlled by the testing software was able to score against the team controlled by the FIFA-99 program **999 out of 1000 test runs.**

James Tam

Computer Vision

- Determining what an object is based on it's visual appearance
 - e.g. Which is the real me



For more information: <http://pages.cpsc.ucalgary.ca/~parker/DML/welcome.html>

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?

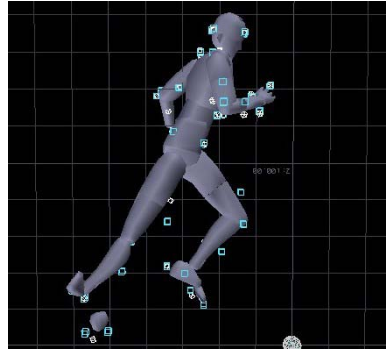


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A Computer Vision Project: Video Analysis Of Runners



Collecting the raw data



Computerized version of the raw data

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

James Tam

A Computer Vision Project: Video Analysis Of Runners

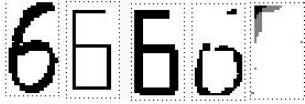


Computer analysis of the raw data

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Other Computer Vision Projects: Identifying A Person

- Handwriting analysis
 - How to recognize written text
 - How to recognize a particular handwriting style



- Facial recognition (distinguish and recognize)

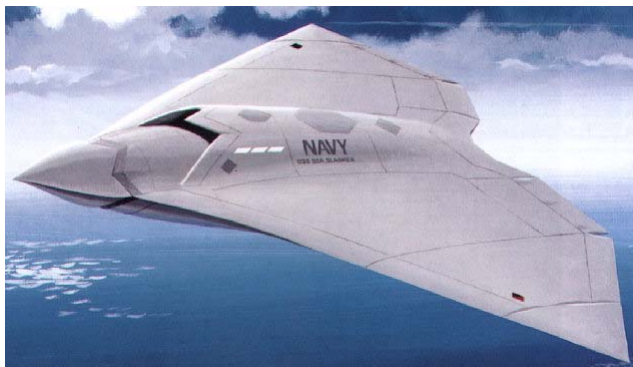


For more information: <http://pages.cpsc.ucalgary.ca/~parker/>

James Tam

Yet Another Computer Vision Project: The UAV (Unmanned Air Vehicle) Project

- UAV includes aircraft that fly without a flight crew.
 - They may be operated remotely
 - Or they may operate autonomously (then it must be able to 'see'!)



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

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.



Halo 2 © Microsoft

<< Warning!!! >>

Blatant
advertisement

<< Warning!!! >>

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

James Tam

Reminders

These slides can be found under the following urls:

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- PowerPoint: <http://www.cpsc.ucalgary.ca/~tamj/2006/springTalk.ppt>

Who am I?



An instructor of many Comp-Sci courses

- CPSC 001
- CPSC 203
- CPSC 231
- CPSC 233
- CPSC 235
- CPSC 331
- CPSC 481

What courses do I teach in the fall?

- CPSC 231: Computer Science majors must take it!
Students in other areas of science? It depends.

James Tam