

# Connecting with Computer Science

CPSC101/WMST201

<http://www.ugrad.cs.ubc.ca/~cs101/2007s1>

Instructor: KangKang Yin

## Overview

- ▶ Course Objectives
  - link computing to other disciplines
  - use computers as creative and practical tools
  - learn core principles of computer science
  - develop a long-term interest in computing
- ▶ Course Contents
  - Introduction
    - ▶ Algorithms
    - ▶ Computers outside-in
    - ▶ Networking
    - ▶ Javascript Programming
  - Connection
    - ▶ Arts
    - ▶ Biology
    - ▶ Psychology
    - ▶ Music

## Overview

- ▶ Textbook
- ▶ PRS Clicker
- ▶ Course Work
  - two in-class quizzes (12%)
  - PRS mini-quizzes (3%)
  - laboratory assignments (15%)
  - project (15%)
  - in-class midterm exam (20%)
  - final exam (35%)
- ▶ TAs:
  - Firas Hamze
  - Hosna Jabbari
  - Mengxi Hu
  - Henry Chow

## What and Where is Computation

Some Cool Things We Do in  
Computer Science

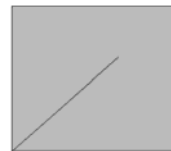
## Computer Science, Eh?

- ▶ I entered CS because my parents thought "it's good for girls. sitting in an office, typing in stuff."
- ▶ My families and non-CS friends ask me "you are a PhD in computer science, how come you can't fix my broken laptop?"
- ▶ Survey time: How about you? What do you think CS is about? What do you and the people around you use computers for?

*Algorithms*

## Origami Problem

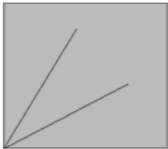
- ▶ how can you bisect a corner of a square piece of paper?



*Algorithms*

## Origami Problem

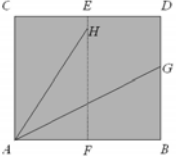
► Trisect?



*Algorithms*

## Origami Problem


1. create vertical line  $EF$  by folding in half
2. create line  $AG$  by folding through corner  $A$  so that corner  $B$  meets the line  $EF$
3. create line  $AH$  by folding through corner  $A$  so that corner  $C$  meets point  $G$
4. Voila!



*Algorithms*

## Origami Problem

► see creative origami by Joesph Wu (a former UBC CS student!):  
[www.origami.as/home.html](http://www.origami.as/home.html)




*Algorithms*

## Algorithm

- Algorithm: sequence of **operations, or basic steps**, needed to solve a problem
- A central activity in CS
- Algorithm design strives for **elegance** and **efficiency**

## Algorithms on a GPS

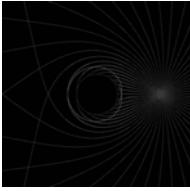
TSP(traveling salesman problem):  
 from a series of addresses, the GPS will take you on "a" lowest time/distance route between the several destination.



<http://www.garmin.com/garmin/cms/site/us>

*Scientific Computing*

## Simulating Blackhole



<http://www.paddle.mb.ca/Students/bh1.mov>

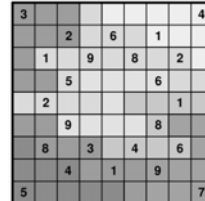
### Minesweeper

- ▶ A type of difficult problems we call NP-Complete



### Sudoku(数独)

- ▶ fill a 9x9 grid so that each column, each row, and each of the nine 3x3 boxes contains the digits from 1 to 9.



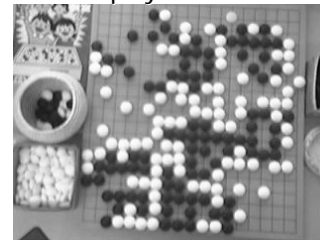
### Sudoku(数独)

- ▶ <http://en.wikipedia.org/wiki/Sudoku>



### Go(围棋,碁)

- ▶ Unlike chess, so far computers cannot beat the best human players.



A game I am losing to a labmate.

### Did you google it?




### What we can do to a bunny?



<http://www-static.cc.gatech.edu/~turk/bunny/bunny.html>

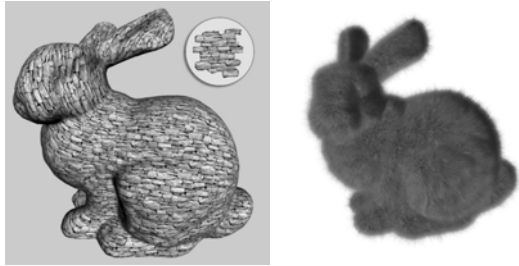
Computer Graphics

### What we can do to a bunny?



Computer Graphics

### What we can do to a bunny?



"Lapped Textures"  
Emil Praun, Adam Finkelstein, and Hugues Hoppe  
Siggraph 2000, pp. 465-470

"Real-Time Fur over Arbitrary Surfaces"  
Jed Lengyel, Emil Praun, Adam Finkelstein, and Hugues Hoppe  
ACM Symposium on Interactive 3D Graphics  
Research Triangle Park, North Carolina, 2001  
pp. 227-232

Computer Graphics

### What we can do to a bunny?



<http://www.cs.ubc.ca/~sheffa/proj.html>

Computer Graphics

### What we can do to a bunny?

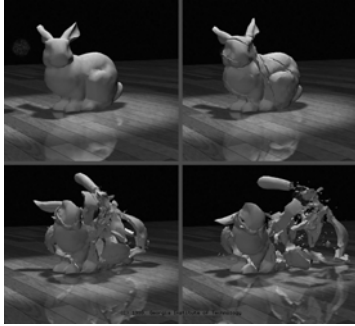



Image appears in  
"Animating Fracture"  
James F. O'Brien and Jessica K. Hodgins  
Communications of the ACM  
Vol. 43, No. 7, July 2000

Computer Graphics

### What we can do to a bunny?



"Melting and Flowing"  
Mark Carlson, Peter Mucha,  
Brooks Van Horn III, and Greg Turk  
ACM Symposium on Computer Animation  
San Antonio, Texas, July 21-22

Computer Graphics

### Enough of bunny, here is a Buddha



<http://graphics.stanford.edu/~fedkiw/animations/buddha2.mov>

<http://graphics.stanford.edu/~fedkiw/>

Computer Graphics: from bunny to preserving Art

## Digital Michelangelo



<http://graphics.stanford.edu/projects/mich/>

Computer Graphics: Photorealistic Rendering

## Fake or Foto?



<http://www.autodesk.com/eng/etc/fakeorfoto/quiz.html>

Computer Graphics: Photorealistic Rendering

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Computer Graphics: Photorealistic Rendering

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Computer Graphics: digitalized world

## True Lies

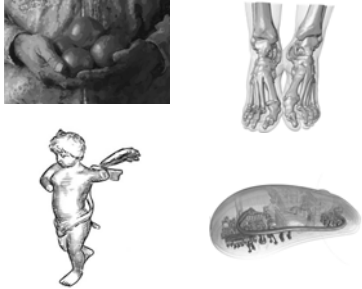


<http://www.campaignforrealbeauty.com/flat4.asp?id=6909>



<http://en.wikipedia.org/wiki/Image:Titanicpic1.JPG>

*Computer Graphics: Non-Photorealistic Rendering*  
**We think we can be artists too!**



<http://www.cs.ucdavis.edu/~ma/SIGGRAPH02/course23/>

*Computer Graphics*  
**Auto Collage**



C. Rother, L. Bordeaux, Y. Hamadi, and A. Blake,  
 ACM Transactions on Graphics (SIGGRAPH'06),

*Computer Vision*  
**A 2-million dollar contest**

- **DARPA Grand Challenge 2005**
- 132 miles. 23 vehicles. 0 drivers. Stanley, a VW Touareg, wins the race of the century.



A team led by Sebastian Thrun, Mike Montemerlo,  
 Journal of Field Robotics 23(9), 661-692 (2006)

*AI and Robotics*  
**Robocup**

- Proposed in 1993 by Professor Alan Mackworth from UBC CS.
- 440 teams from 35 countries/regions participated in RoboCup 2006 Bremen

*AI and Robotics*  
**Robocup**



<http://www.robocup.org/>

*Human Computer Interaction(HCI)*  
**Graphical User Interface(GUI)**



*Human Computer Interaction*

## Brain Wave



<http://www.ibva.com/>



<http://www.local6.com/news/4643968/detail.html>



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