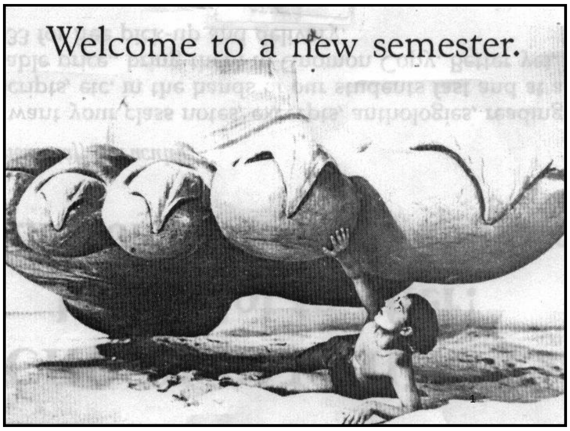


Welcome to a new semester.

CS/ENGRD 2110
Object-Oriented Programming and Data Structures

Spring 2011

Thorsten Joachims

Lecture 1: Overview

http://courses.cs.cornell.edu/cs2110

Course Staff

- Instructor
  - Thorsten Joachims (tj@cs.cornell.edu)
- Teaching Assistants
  - Nikos Karampatziakis (nk@cs.cornell.edu)
  - Robert Escriva (escriva@cs.cornell.edu)
  - 7 more TAs are TBD
- Consultants
  - TBD

Course Staff

- Teaching Assistants
  - Lead sections (“recitations”, “discussions”) starting next week
  - Act as your main contact point
- Consultants
  - In Upson 360, hours online
  - “Front line” for answering questions
  - consulting hours start next week
- More info?
  - See website

What is wrong with this Program?

```
public class Mystery {
   public static void main(String[] args) {
     int[] a = {7, 121, 12, 13, 9, 324, 1};
     boolean d;
     do {
       d = false;
       for (int b = 1; b < a.length; b++) {
         if (a[b-1] > a[b]) {
           int c = a[b];
           a[b] = a[b-1];
           a[b-1] = c;
           d = true;
         }
       }
     } while (d);
     for (int e : a) {
       System.out.println(e);
     }
   }
}
```

➔ Output: “1, 7, 9, 12, 13, 121, 324,”

Moore’s Law

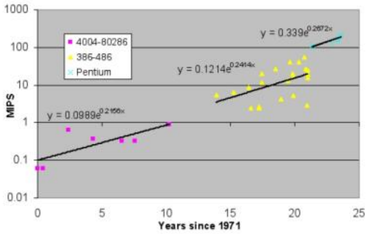


Figure 5: Processor performance in millions of instructions per second (MIPS) for Intel processors, 1971-1995.

From *Lives and death of Moore’s Law*, Ilkka Tuomi, 2002

Grandmother’s Law

- Brain takes about 0.1 second to recognize your grandmother
  - About 1 second to add two integers (e.g. 3+4=7)
  - About 10 seconds to think/write statement of code
- Your brain is not getting any faster!

Why the world need CS 2110!

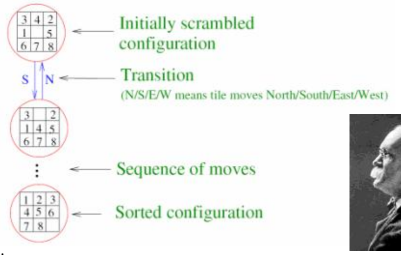
- Real systems are large and complex.

Year	*Operating System*	*Millions of lines of code**
1993	Windows NT 3.1	6
1994	Windows NT 3.5	10
1996	Windows NT 4.0	16
2000	Windows 2000	29
2001	Windows XP	40
2005	Windows Vista	50

*source: Wikipedia

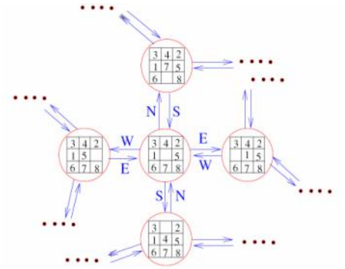
- Computer Science ➔ Managing Complexity
  - Analyze highly complex situations
  - Decompose problem into independent components
  - Assure correctness of components
  - Reuse prior work that is proven correct
  - Spread work over multiple people

Sam Loyd’s 8 Puzzle



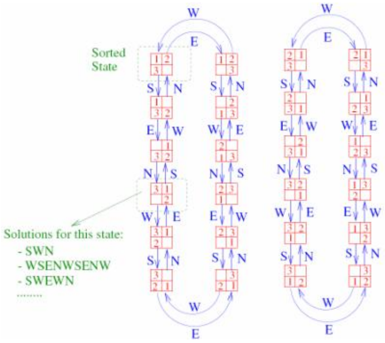
- Goal:
  - Given an initial configuration of tiles, find a sequence of moves that will lead to the sorted configuration.
- A particular configuration is called a state of the puzzle.

State Transition Diagram of 8-Puzzle



- State Transition Diagram: picture of adjacent states.
- A state Y is adjacent to state X if Y can be reached from X in one move.

State Transition Diagram for a 2x2 Puzzle



Graphs

- State Transition Diagram in previous slide is an example of a graph: a mathematical abstraction
  - vertices (or nodes): the puzzle states
  - edges (or arcs): connections between pairs of vertices
  - vertices and edges may be labeled with some information (name, direction, weight, cost, …)
- Graphs: vocabulary/abstraction for problems
  - Airline routes
  - Roadmaps
  - Social network
  - etc.

Path Problems in Graphs

- Is there a path from node A to node B?
  - Solve the 8-puzzle
- What is the shortest path from A to B?
  - 8-puzzle (efficiently)
  - MapQuest
- Network flow
  - Friendship structure of facebook
- Eigenvectors
  - Pagerank in Google
- Hamiltonian cycles

Course Objectives

- An introduction to computer science and software engineering
- Concepts in modern programming languages
  - recursive algorithms and data structures
  - data abstraction, subtyping, generic programming
  - frameworks and event-driven programming

  → Organizing large programs
- Building blocks: data structures and their algorithms
  - arrays, lists, stacks, queues, trees, hashtables, graphs
- Algorithm analysis and designing for efficiency
  - asymptotic complexity, induction
- Graphical user interfaces
- Using Java, but not a course on Java!

Why you need CS 2110?

- Fun and intellectually interesting: cool math ideas meet engineering (and make a difference)
- Crucial to any engineering or science career
  - Good programmers are 10x more productive
  - Leverage knowledge in other fields, create new possibilities
  - Where will you be in 10 years?
- Great job prospects with high salaries…
- Computational Thinking: You'll learn to think in a more logical, structured way
- Computational thinking pervades almost every subject of inquiry in today's world

Are you ready for CS2110?

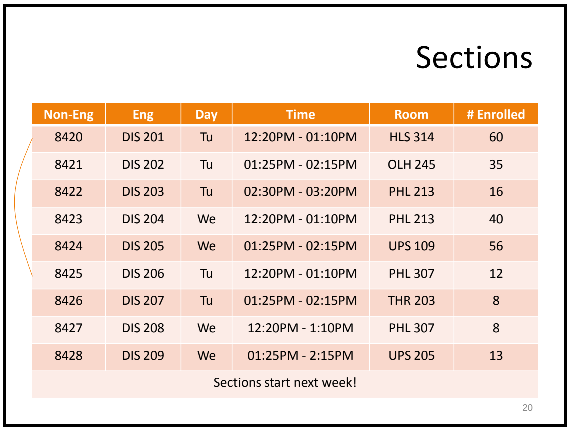
- CS2110 assumes you know Java
  - You took CS1110 at Cornell
  - You have "completed" CS1130
  - Or took a high school course and got a 4 or 5 on the CS AP exam
- CS2110 assumes you actually remember Java
  - Go over online material of CS1130
  - classes, objects, fields, methods, constructors, static and instance variables, control structures, arrays, strings, exposure to inheritance
- Don't take CS1110 just because you are worried that your high school Java experience won't do
- *We recommend against trying to skip directly into CS3110. Doing so requires permission from both Professor Joachims and Professor Joachims!*

Lectures

- Time and place
  - Tuesday/Thursday 10:10-11am, Olin 155
  - Attendance is mandatory
  - In-class quizzes
- ENGRD 2110 or CS 2110?
  - Same course! We call it CS 2110
  - Non-engineers sign up for CS 2110
  - Engineers sign up for ENGRD 2110
- Reading and examples will be posted online together with lecture notes

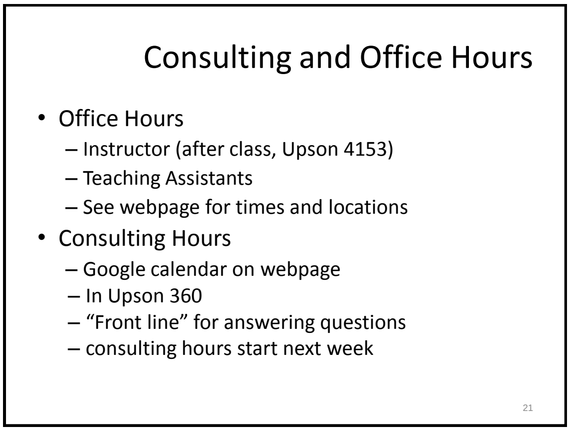
Sections

- Each section will be led by a TA
  - Usually review, help on homework
  - Sometimes new material
- Everybody needs to register for a section
  - Section numbers are different for CS and ENGRD
  - Like lecture, attendance is mandatory
  - No permission needed to switch sections
  - We recommend that you do NOT switch often
- You may attend more than one section if you wish



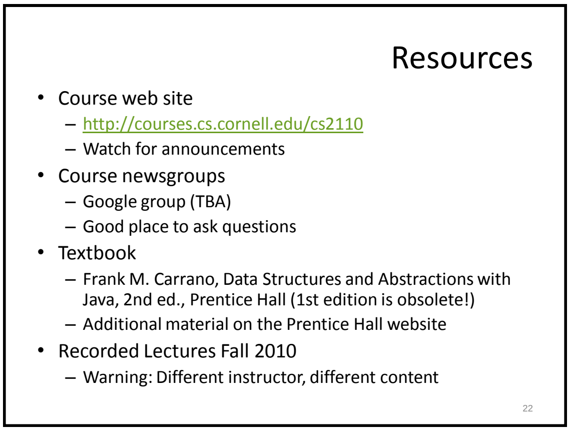
Sections

Non-Eng	Eng	Day	Time	Room	# Enrolled
8420	DIS 201	Tu	12:20PM - 01:10PM	HLS 314	60
8421	DIS 202	Tu	01:25PM - 02:15PM	OLH 245	35
8422	DIS 203	Tu	02:30PM - 03:20PM	PHL 213	16
8423	DIS 204	We	12:20PM - 01:10PM	PHL 213	40
8424	DIS 205	We	01:25PM - 02:15PM	UPS 109	56
8425	DIS 206	Tu	12:20PM - 01:10PM	PHL 307	12
8426	DIS 207	Tu	01:25PM - 02:15PM	THR 203	8
8427	DIS 208	We	12:20PM - 1:10PM	PHL 307	8
8428	DIS 209	We	01:25PM - 2:15PM	UPS 205	13
Sections start next week!					



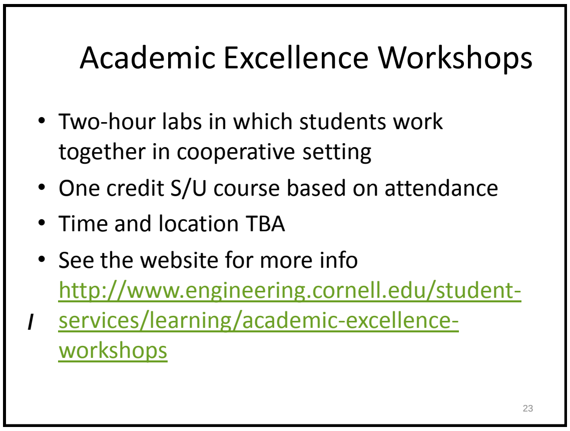
Consulting and Office Hours

- Office Hours
  - Instructor (after class, Upson 4153)
  - Teaching Assistants
  - See webpage for times and locations
- Consulting Hours
  - Google calendar on webpage
  - In Upson 360
  - “Front line” for answering questions
  - consulting hours start next week



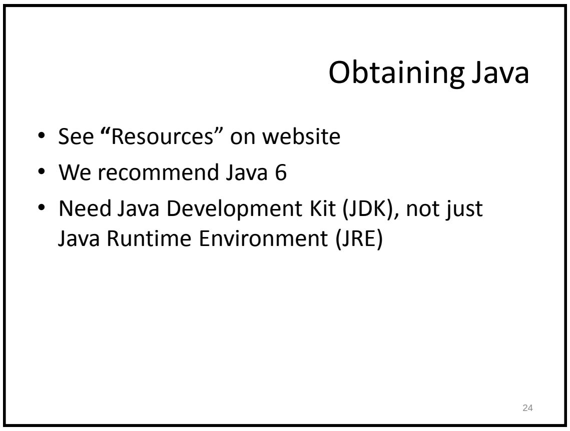
Resources

- Course web site
  - http://courses.cs.cornell.edu/cs2110
  - Watch for announcements
- Course newsgroups
  - Google group (TBA)
  - Good place to ask questions
- Textbook
  - Frank M. Carrano, Data Structures and Abstractions with Java, 2nd ed., Prentice Hall (1st edition is obsolete!)
  - Additional material on the Prentice Hall website
- Recorded Lectures Fall 2010
  - Warning: Different instructor, different content



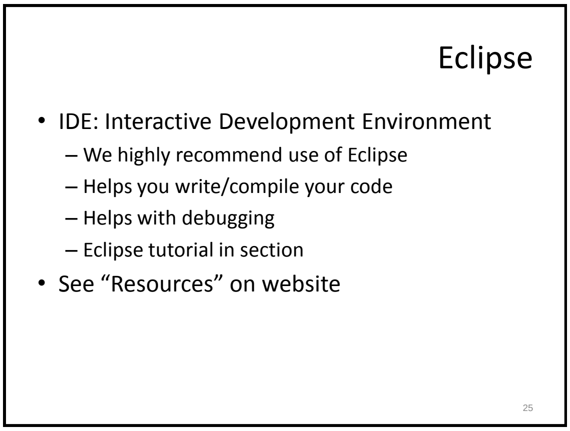
Academic Excellence Workshops

- Two-hour labs in which students work together in cooperative setting
- One credit S/U course based on attendance
- Time and location TBA
- See the website for more info http://www.engineering.cornell.edu/student-services/learning/academic-excellence-workshops



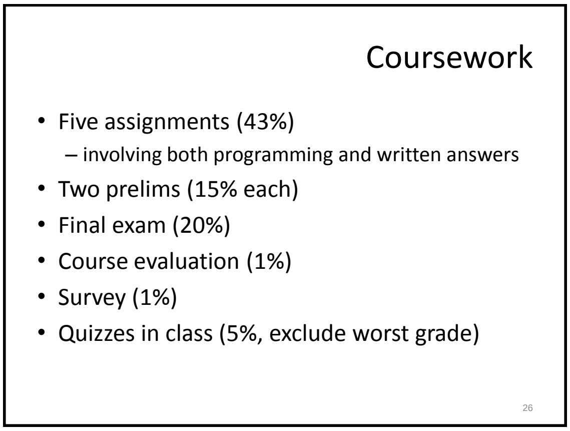
Obtaining Java

- See “Resources” on website
- We recommend Java 6
- Need Java Development Kit (JDK), not just Java Runtime Environment (JRE)



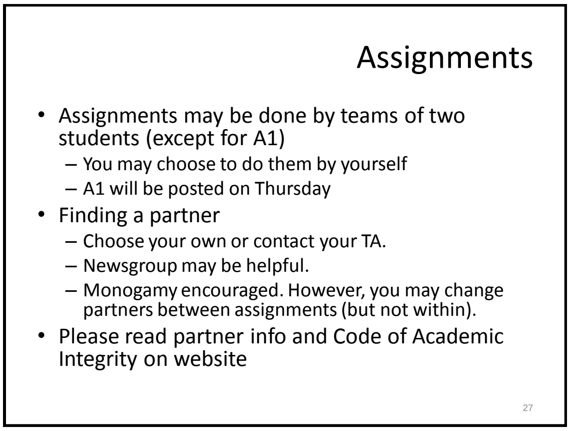
Eclipse

- IDE: Interactive Development Environment
  - We highly recommend use of Eclipse
  - Helps you write/compile your code
  - Helps with debugging
  - Eclipse tutorial in section
- See “Resources” on website



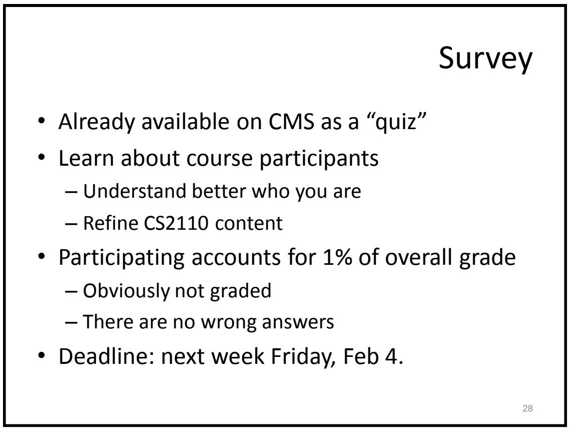
Coursework

- Five assignments (43%)
  - involving both programming and written answers
- Two prelims (15% each)
- Final exam (20%)
- Course evaluation (1%)
- Survey (1%)
- Quizzes in class (5%, exclude worst grade)



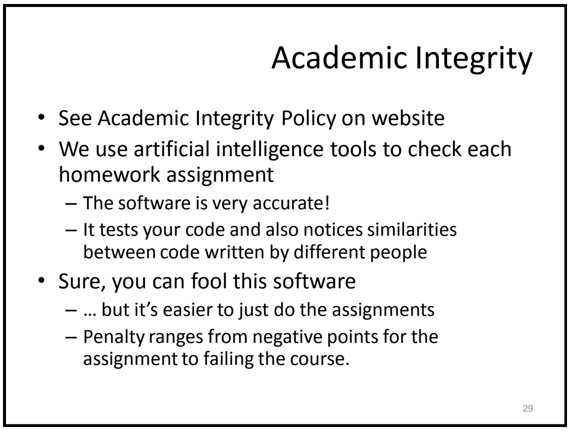
Assignments

- Assignments may be done by teams of two students (except for A1)
  - You may choose to do them by yourself
  - A1 will be posted on Thursday
- Finding a partner
  - Choose your own or contact your TA.
  - Newsgroup may be helpful.
  - Monogamy encouraged. However, you may change partners between assignments (but not within).
- Please read partner info and Code of Academic Integrity on website



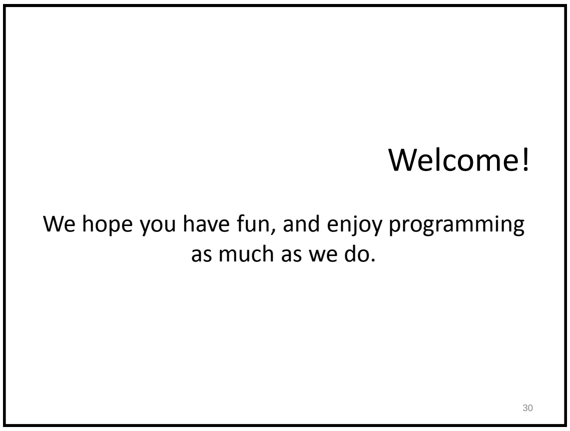
Survey

- Already available on CMS as a “quiz”
- Learn about course participants
  - Understand better who you are
  - Refine CS2110 content
- Participating accounts for 1% of overall grade
  - Obviously not graded
  - There are no wrong answers
- Deadline: next week Friday, Feb 4.



Academic Integrity

- See Academic Integrity Policy on website
- We use artificial intelligence tools to check each homework assignment
  - The software is very accurate!
  - It tests your code and also notices similarities between code written by different people
- Sure, you can fool this software
  - … but it’s easier to just do the assignments
  - Penalty ranges from negative points for the assignment to failing the course.



Welcome!

We hope you have fun, and enjoy programming as much as we do.