

CS 1114: Introduction to Computing Using MATLAB and Robotics

Prof. Noah Snavely

<http://cs1114.cs.cornell.edu>



Cornell University
Computer Science

Overview



- What is CS 1114?
 - An honors-level intro to CS using camera-controlled robots (Sony Aibo, iRobot Create)
 - An alternative to CS1112 or CS1132, to fulfill your Matlab computing requirement
 - Formerly known as CS100R

Goals of CS1114

- Give you an intuition about computation problem solving
- Teach you useful (and interesting) computer science
- Give you fluency in the Matlab programming environment
- Have fun with robots

Requirements

- Exposure to programming (in any language)
- Some interest in math
 - Computer science is about much more than programming, and so is this course

Many options for intro computing courses

- CS1110, CS1113 – Java
- CS1112, CS1114 – Matlab

CS111X AND CS113X

Beginning Fall 2007: every engineering student takes CS111X (4 credits) and CS113X (1 credit)

CS1112 or CS1114 (this course). Then CS1130.
Matlab, then Java

or

CS1110 or CS1113. Then CS1132.
Java, then Matlab.

CS2110 prerequisite: CS1110 or CS1130.

CS1110: Intro to Computing using Java

Prof. David Gries and Prof. Lillian Lee

<http://www.cs.cornell.edu/courses/cs1110/2009sp/>

No previous programming experience required.

No calculus required.

Course outcomes: A basic understanding of object-oriented and procedural aspects of programming, as expressed in Java.

Fluency in writing Java programs.

CS1130 Transition to object-oriented programming

Will be given every semester.

Self-paced, 4-week, course, relying on lectures (web lectures, like blogs are web logs). Can do it in shorter time, if you want. Take a look at course website:

<http://www.cs.cornell.edu/courses/cs1130/2009sp/>

CS1132, about Matlab, will be offered as well. It is also a self-paced 4-week course.

CS1112: Intro to Computing using Matlab

Prof. Daisy Fan & Prof. Charles Van Loan

<http://www.cs.cornell.edu/courses/cs1112/2009sp/>

No previous programming experience required.

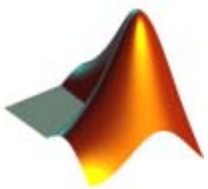
No calculus required.

Course outcomes: A basic understanding of programming and problem solving using Matlab.

Fluency in writing Matlab programs.

Java or Matlab?

- Both CS1110 and CS111 [24] teach fundamental problem solving skills and computer science techniques
- The destination is the same...
- ... but the vehicle is different



(inspired by Charlie Van Loan)

Questions?



Robots: 2029



Robots: 2009



Sony AIBO



iRobot Create

Robots: cute but dumb

- What do they know about the world around them?
 - Without your help, very little
 - Can't even notice a bright red lightstick
- Your mission: make them smarter
- Lots of interesting math and computer science, some computer programming
 - Lots of experience with programming, even with robots, won't give you a leg up in 1114



Course webpage

The screenshot shows the course webpage for CS1114. The header includes the Cornell University logo and the Department of Computer Science name. A search bar is located in the top right corner. Below the header is a navigation menu with links for Course info, Staff info, Lectures, Assignments, Helpful links, and Sponsors. The main content area features the course title and semester. There are three columns of information: Announcements, Logistics, and three featured topics. The Announcements section mentions an article in the Cornell Chronicle. The Logistics section lists meeting times and locations. The featured topics include 'A CS100 with robots?' (honors course with Aibo and Roomba), 'And with computer vision?' (teaching basic computer vision techniques), and 'Matlab' (used as the programming language).

Cornell University
Department of Computer Science

SEARCH CORNELL: go

Pages People more options

Course info Staff info Lectures Assignments Helpful links Sponsors

CS1114: Introduction to Computing using Matlab and Robotics

Spring 2009

Announcements

- The [Cornell Chronicle](#) is running an [article](#) about CS1114 (formerly CS100R). [[PDF version](#)]


Logistics

CS1114 meets 3 times per week, as follows:

- Tuesday and Thursday 11:15-12:05 for lectures in Phillips 407.
- Wednesday for sections in the lab, Upson 317. Sections are 1:25-2:15, 2:30-3:20, and 3:35-4:25.


There is no textbook for this course. CS1114 adheres to the [Academic Integrity Code](#) of the Computer Science Department.

A CS100 with robots?



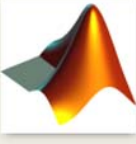
This is an honors course that teaches basic programming concepts to students using two robot platforms: the Sony Aibo and the iRobot Roomba.

And with computer vision?



The course also teaches programming with basic computer vision techniques. Students write programs that process and analyze images they capture.

Matlab



Matlab is used as the programming language. It features an interactive programming environment and easy manipulation of image data.

<http://cs1114.cs.cornell.edu/>

Staff

- Noah Snavely – Instructor
- Steven An – Teaching Assistant
- Devin Kennedy – Head Consultant
- Harry Beyel – Consultant
- Yuzhe Liu – Consultant
- Aaron Sarna – Consultant
- Neil Sexton – Consultant
- Sara Tansey – Consultant
- Bennett Wineholt – Consultant

About me

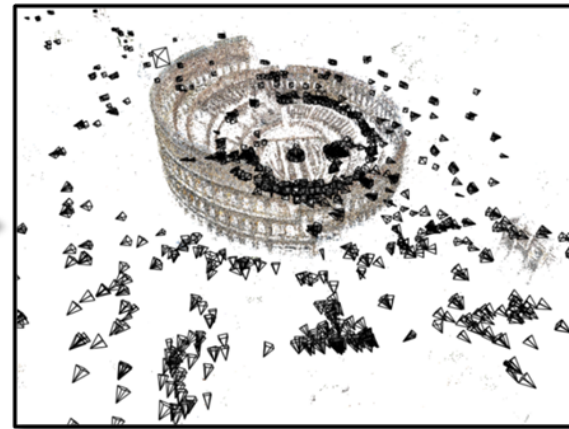
- Noah Snavely
- <http://www.cs.cornell.edu/~snavely/>
- Research
 - Computer vision
 - Computer graphics

Research focus

- 3D reconstruction from unorganized image collections



Flickr photos ("Colosseum")



Automatic 3D reconstruction

- Microsoft *Photosynth*
- Will give an evening lecture (TBA)

CS1114 Logistics

- Lectures: Tue Thu 11:15–12:05, PHL 407
- Sections:
 - Wed 1:25 - 2:15, Upson 317
 - Wed 2:30 - 3:20, Upson 317
 - Wed 3:35 - 4:25, Upson 317
 - Please go to same section for the entire course
- Occasional evening lectures (optional)
 - First lecture will be in next week (TBA)



CS1114 Logistics

- CS1114 lab: Upson 317
- You will soon have access to the lab and passwords for the computers
- Office hours will generally be held in the lab (hours to be announced soon)



Assignments

- Approximately one mini-quiz per week
 - In class, usually at start of Thursday lecture
 - Corollary: be on time, or write fast...
- 5-6 robot programming assignments with multiple parts
 - You will demo each part to the lab TA's
- 3 prelims, probably in-class
- Free-form final project (required)

Major CS1114 Projects

- From a camera, figure out the position of a bright red lightstick
 - Use this to guide a robot around



What we see

0	3	2	5	4	7	6	9	8
3	0	1	2	3	4	5	6	7
2	1	0	3	2	5	4	7	6
5	2	3	0	1	2	3	4	5
4	3	2	1	0	3	2	5	4
7	4	5	2	3	0	1	2	3
6	5	4	3	2	1	0	3	2
9	6	7	4	5	2	3	0	1
8	7	6	5	4	3	2	1	0

What the robot sees

Major CS1114 Projects

- Build a robot speedometer/accelerometer
- Robot security guard
 - Detect and track moving objects
- Track robots from an overhead camera
- Do Something Cool (final project)

Grading

- Programming assignments (10-20%)
- In-class quizzes (15-25%)
- Prelims (50-60%)



For next time

- Visit the course website
<http://cs1114.cs.cornell.edu>
- Read the Matlab tutorial
- Attend section in the lab tomorrow

Questions?

