Introduction to Robotics

Course Code: Art Center College of Design. HSCI-231-01
Time-Space: Fall 2013, Wednesdays 7:00-10:00 PM, Room ANNX-A8
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Course Summary

Introduction to Robotics offers you the opportunity to explore the increasing role of automated mechanisms in our world and learn what it takes to build your own robots. This course is part survey, part technical application. Hands-on robot designing and building figures strongly – We encounter topics through team "design challenges," in which we see what makes up a robot and investigate ways to control them to do what we want.

Learning Objectives

- Understand the physical principles behind how a robot works, including knowledge of the essential robot components and the functional implications of your design choices.
- Advance analytical thinking skills via design of mechanisms and algorithms.
- Acquire the technical vocabulary to discuss robotics.
- Appreciate the multitude of ways robots are currently used and consider future applications, challenges, and solutions.

Tentative Schedule

Class	Topic(s)	Assignment [points]
01 [10 Sep]	Intros: Course, Robots, Lego kits *Challenge: Robot Arm*	Robot definitions [10]
02 [17 Sep]	Robot Kinematics (w/ trigonometry review) *Challenge: Robot Arm*	Kinematics worksheet [15]
03 [24 Sep]	Robot Kinematics *Challenge: Robot Arm* *Seminar: Autonomous Manipulation*	Robot Arm Challenge write-up [25]
04 [01 Oct]	Odometry *Challenge: Odometry I*	Odometry worksheet [15]
05 [08 Oct]	Odometry *Challenge: Odometry II*	Odometry Challenge write-up [25]
06 [15 Oct]	Sensing: Proprioceptive / Exteroceptive *Exercise: Closed-Loop Line Following*	Line Following Exercise write-up [20]
07 [22 Oct]	Localization *Exercise: Localization*	Localization Exercise write-up [20]
08 [29 Oct]	Navigation *Challenge: Bug Algorithm I*	TBD
09 [05 Nov]	Navigation *Challenge: Bug Algorithm II*	Bug Algorithm Challenge write-up [25]
10 [12 Nov]	Feedback Control *Exercise: Feedback Control Laws*	Control Law Exercise write-up [20]
11 [19 Nov]	Control Strategies *Challenge: Sumo Match I*	Sumo Challenge write-up [25]
12 [26 Nov]	Control Strategies *Challenge: Sumo Match II*	Sumo Challenge write-up (cont'd)

The schedule may change based on the interest and needs of the class. Check the website for the latest version.

Assessment

- 80% Assignments
  - Due weekly; focus on individual write-ups of in-class topics and challenges
  - **Resubmission Policy**: Homework can be resubmitted once for a re-grade. However, any resubmitted homework can only receive up to 80% of the total homework score (i.e. out of a 10 pt homework assignment, the maximum number of points you could receive is 8 on a resubmission).
  - **Late Policy**: Late assignments will automatically receive a penalty of 20% off of the score you would have received had the homework been submitted on time. (Note that this is a much more severe penalty than resubmission.)
  - Notes:
    - Turn in assignments when they are due.
    - Reasonable requests for extensions are usually granted.
    - If you are having trouble with the assignment, let the instructors know.
- 20% Participation
  - **You are expected to attend — and be engaged in — every class**. Our focus on *in-class work* makes attendance essential to complete your assignments (and to understand course material!), especially as we do not follow a course textbook. Also, material needed for the entire class session is often dependent on information discussed in the first 10 minutes.

Texts
- References are on reserve at the library, mostly for those interested in hobby robot building.
  - David Hrynkiw and Mark Tilden, *JunkBots, Bugbots, and Bots on Wheels: Building Simple Robots With BEAM Technology* (2002) – similar to above, with focus on reusing parts from broken electronics; more project ideas; see for mousey as well
  - Gareth Branwyn, *Absolute Beginner's Guide to Building Robots* (2003) – a useful reference with good ideas for final projects (i.e. mousey instructions)
  - Keith Brindley, *Starting Electronics Construction* (2005) – more depth on construction techniques
  - Daniel Ichbiah, *Robots: From Science Fiction to Technological Revolution* (2005) – interesting historical and cultural perspectives; survey of current robot applications

Materials
There are no "required" materials for this class.