

EN1-06: Simple Robotics

November 4th, 2016



Schedule

- In the News
- Upcoming Schedule
- Midterm Review Exam
- Project 6 Assignment
- Project 7 Assignment
- Front Panel Picture Control

It's Now (Temporarily) Legal to Hack Your Own Car



<http://spectrum.ieee.org/cars-that-think/transportation/systems/its-now-temporarily-legal-to-hack-your-own-car>

These Robots Are Chains of Tiny Magnetic Beads



<http://www.livescience.com/55610-magnetic-microbead-chain-robots.html>

Upcoming Schedule



Wed, Nov 2nd

Proj 6 & 7
Front Panel Controls

Fri, Nov 4th

Proj 6 & 7
Hands-on

“Tufts Friday”

Mon, Nov 7th

In-Class
Competition (Proj 6)

Tues, Nov 8th

TA Office Hours
(project or midterm)

Wed, Nov 9th

NO CLASS; group
work time

Fri, Nov 11th

NO CLASS;
Vetern’s Day

Mon, Nov 14th

Proj 7: Interactive
Video Game demos

Wed, Nov 16th

Midterm Review
(come with questions)

Fri, Nov 18th

MIDTERM
(in class)

And assign final project...

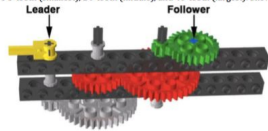
Midterm Exam (Practice Exam)

ENI-06: Simple Robotics
Fall 2016

Practice Midterm

Put your name on any sheets being submitting for Midterm. Need to know who you are.
There are two pages to this midterm (5 questions, total of 20 points)
It is a closed-note/closed-computer/work-by-yourself exam
You have one-hour & 15 minutes to complete the exam.

1. (4 points) For the following gear setup, calculate the ratio (amount) that the "follower" gear will turn when the yellow "leader" turns once. The three gears used in this gear train are 8-tooth (smallest), 24-tooth (middle), and 40-tooth (largest). Show your work.



2. (4 points) The color sensor in the LEGO MINDSTORMS EV3 kit can also be used to detect light levels in two different modes. For these two modes additional modes (beyond "color"), describe in general what they are/why they exist (1pt each) and give a specific example for when you would use each mode (1pt each).

3. (4 points) Professor Danahy wants his robot to turn around, clockwise, in place so that it ends up in the exact same spot but facing 180-degrees in the other direction. What power values would you suggest sending to his "A" motor and what power value to his "C" motor, and give a short explanation why you chose the values that you did.



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Exam Question: Gear Ratios (LEGO MINDSTORMS)



Assignment 6: In-Class Competition (11/7)

Schedule of the Competition (subject to change):

3:00pm: Arrive at class (and cover any logistics)

3:05pm: Competition details announced

3:10pm: Answers to questions regarding Competition

3:15pm: Start developing solutions (hardware/software) for Competition

4:00pm: Stop developing solutions (hardware/software) for Competition

Robots must be in starting position ready to begin Competition

4:10pm: End of Competition, clean-up (leave room as found)

4:15pm: Depart class

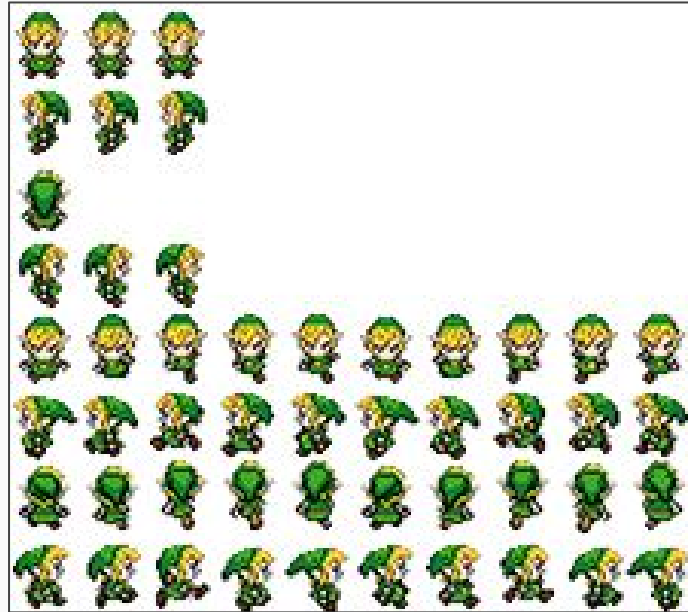
Assignment 7: Interactive Video Game

Project Description: For this project, you will be building an Interactive Video Game. "*Interactive*" means it needs to leverage sensors and react to the user, "*video*" means you should have some GUI (graphical user interface) for the user, and "*game*" meaning it should be fun (and have other gamelike attributes). Also, think about the "*human factors*" (branch of engineering considering the design of the interface between the user and, in this case, the robot) aspects of what you are designing. How are they holding it, interacting with it, and is the game concept well explained and makes sense to the user?

Details (Hardware/Software): You will use the LEGO MINDSTORMS EV3 kit as inputs (and perhaps outputs). Program the software using the LabVIEW Graphical Programming Interface. You can implement your GUI (graphical user interface) on the screen of the EV3 or use a Front Panel Picture Control in LabVIEW. You can work in pairs (2-people) or groups-of-four.

When creating an interactive game using your EV3, if you base it (conceptually) on an existing game (which is fine), try and add a unique twist/element to make it your own. Or you can invent a brand new game! It can be single player or multiplayer. Use your creativity to design the interactions and your building and programming skills to create it with the LEGO MINDSTORMS EV3 and program it in LabVIEW. Be sure to consider the "client" (the player(s) of the game) and how they are interacting and enjoying the experience. And be sure to provide them enough information (e.g. on the screen, or in terms of feedback in other ways; and remember that people don't often read instructions!).

Front Panel Picture Control (version 5)



Hands-on: Graphic Manipulation

EV3 Screen Manipulation:

- (1) Erase screen and write text to the screen
 - (a) Wait for sensor, and then change text
 - (b) Display different text based on different sensor readings
- (2) Change line number text is being written on by reading the motor value (scrolling text?)
- (3) Draw a circle and draw a square on the screen
- (4) Change the position of the circle and the square based on the motor value

Front Panel Picture Control Manipulation:

- (1) Draw a circle and draw a (big) square on the screen
- (2) Move the circle on the screen based on the motor value(s)
- (3) If the circle touches the square, exit the loop (game over)
- (4) Load in an external graphic file instead of the circle
- (5) Make smaller squares inside the big square; check locations of all of these against circle