

EN1-06: Simple Robotics

Fall 2016

Practice Midterm

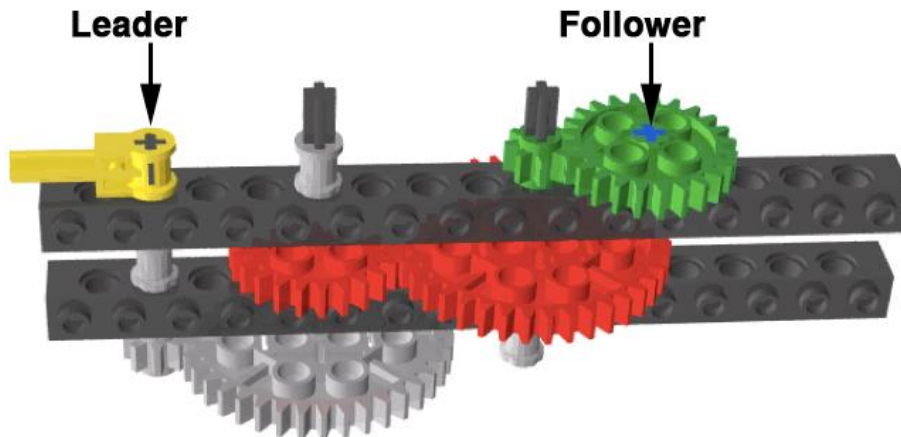
Put your name on any sheets being submitting for Midterm. Need to know who you are.

There are two pages to this midterm (5 questions, total of 20 points)

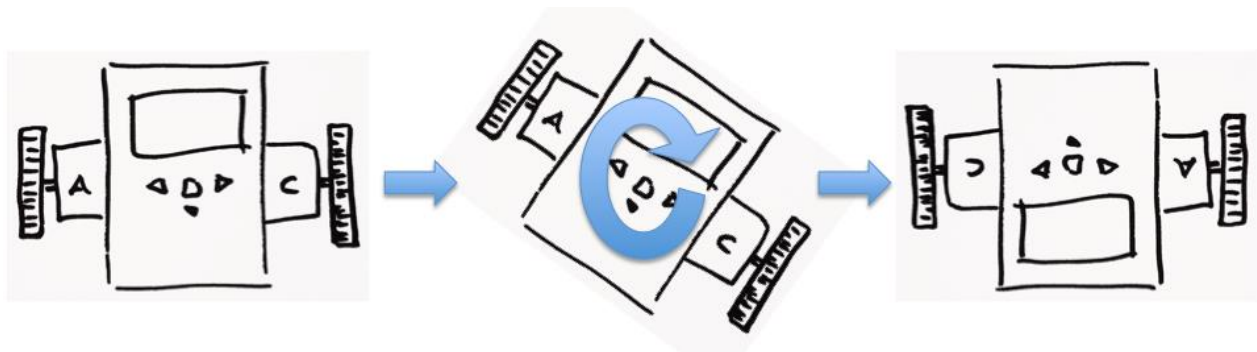
It is a closed-note/closed-computer/work-by-yourself exam

You have one-hour & 15 minutes to complete the exam.

1. (4 points) For the following gear setup, calculate the rate (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.



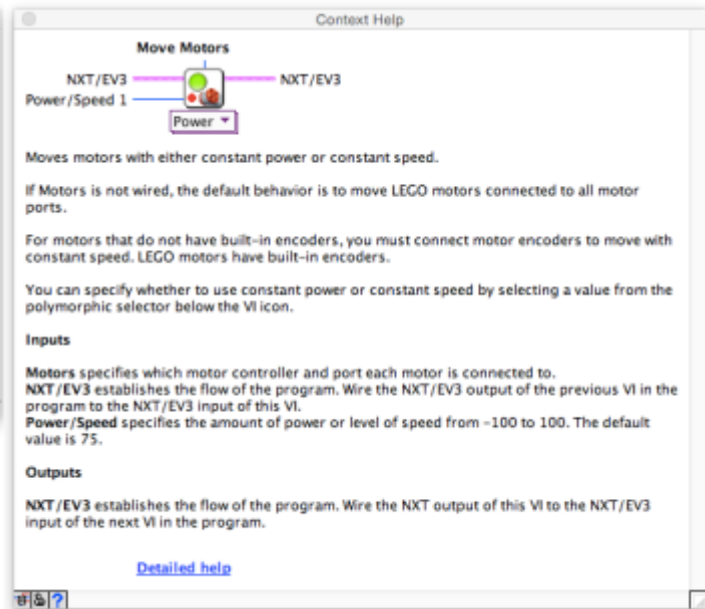
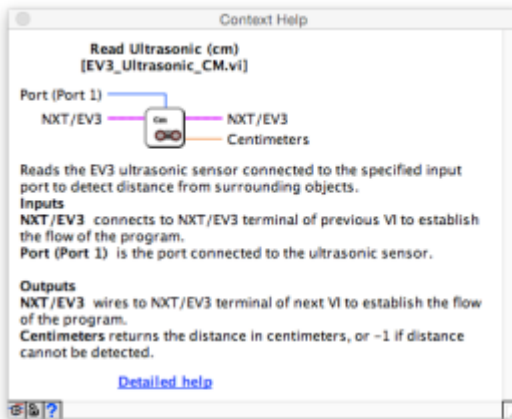
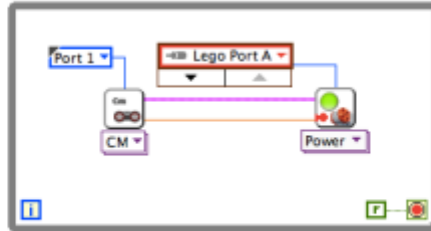
2. (4 points) The color sensor in the LEGO MINDSTORMS EV3 kit can also be used to detect light levels in two different modes. For these two modes additional modes (beyond “color”), describe in general what they are/why they exist (1pt each) and give a specific example for when you would use each mode (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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4. (4-points) In the following LabVIEW code, the output from the Read Ultrasonic (cm) sensor (reading in the range of 0cm to 255cm) function is plugged directly into the Move Motors command to try and control the speed of a one-motor car (Port A) based on the distance read by the Ultrasonic Sensor (larger distance, faster speed). What is the limitation of the system (for what values will this work, and for what values will this not work, considering both the output of the ultrasonic and the input of the motor)? How can this code be improved to be more responsive to a wider range of distances (describe and draw out your code)?



5. (4 points) Professor Danahy gives an open-ended assignment to “build a musical instrument” using your LEGO MINDSTORMS EV3 kit and any other LEGO parts you find around the CEEO (therefore, you can use more parts than just what comes in your kit, but are limited to LEGO products). Your robot must take user input(s), and be able to play 3 (or more!) tones. Give an overview of your design (describe hardware choices, sketch out robot configuration, being sure to label parts and ports) and indicate what your LabVIEW code would be (again, sketch/describe/etc) in order to make this work.