

Project-I, Part-III

Part III is due **November 14**

Part III:

(35 points)

This part of the assignment varies based on whether you are enrolled in EE 485 or CES 592.

Assignment:

- If you are enrolled in EE 485:
 - You will do this part of the project in a group of two.
 - Write a program that utilizes angles determined in part II to send rotation instructions to the servo motors. The program should take θ_1 to θ_5 as input and send instructions to the motors to move the joints accordingly.
 - *This is optional and will not affect your grade \rightarrow you can combine program above with the program in Part-II to take the gripper coordinates ($o = [o_x, o_y, o_z]^T$) as input and move the joints accordingly.*
- If you are enrolled in CES 592:
 - You will do this part of the project individually.
 - Continuing from the program developed in Part-II, write a program that takes two coordinates for the gripper ($o_1 = [o_{x1}, o_{y1}, o_{z1}]^T$ & $o_2 = [o_{x2}, o_{y2}, o_{z2}]^T$), orientation of the wrist, and open & close sequence as input and sends appropriate rotation instructions to the servo motors such that the palm of the gripper moves to point o_1 from its current location, performs grip open or close task, moves to o_2 performs grip open or close task, and moves back to where it started from.

Information on coding:

Arduino IDE, Version 1.0.6 (newer versions are not supported)

<https://www.arduino.cc/en/Main/OldSoftwareReleases>

Download “arbotix-master” hardware and libraries zip file from Moodle, Project tab.

The zip file contains three folders and readme file: copy all of the to Arduino user folder (this is not the folder where the IDE is itself is located. The location of this folder varies based on your operating system. See instructions below. If you already have a libraries folder, you can merge them.

Windows XP

```
My Documents\Arduino\
```

Windows Vista/7

```
Documents\Arduino\
```

Mac/Linux

```
~/Documents/Arduino/
```

Where '~' represents the path to your user account.

Download Project_1 zip file from Moodle, Project tab. This contains files you will need to get started. You will add your code in the Project1() function of the file. Please check out the file to find additional information.

With the ver 1.0.6 IDE and the added ArbotiX-M hardware libraries, you should be able to compile the sketch on your own computer. Once you are ready, you can flash the robotic arm and test it. Use the serial monitor. Option 5 executes your code.

Below is the language reference page and a few ArbotiX-M specific commands.

Language Reference: <https://www.arduino.cc/en/Reference/HomePage>

“SetPosition(Servo_ID, position)” moves the servo to assigned position. For example, SetPosition(1, 512) moves servo 1 to 512 position.

“ax12GetRegister(Servo_ID, 36, 2)” reads the current position of the servo. For example, ax12GetRegister(4, 36, 2) gets the current position of servo 4.

Arm and Servo Information:

There are five joints and eight servo motors. Each servo motor has an assigned ID.

Joint1 is actuated by Servo 1

Joint2 is actuated by Servo 2 & 3. Note that these two servos rotate in opposite directions.

Joint3 is also actuated by two servos, 4 & 5, and they too rotate in opposite directions.

Joint4 is actuated by servo 6

Joint 5 by servo 7

and grip by servo 8

The position of the servo changes from 0 – 1024, relating to 0 to 60 degrees. Center position for all of the motors are 512. Current home position is set to 512, 256, 768, 256, 768, 512, 512, 512 for servos 1-8.

NOTE that the joints cannot take all values 0-1024.

We will discuss this project in the class, Tuesday. If you have never used Arduino IDE before or need any help, use my office hours. I will be happy to help you get started.