

## SE 423 Mechatronics Homework Assignment #5

Spring 2024, Question 1 Due In Lecture April 17<sup>th</sup>. Question 2 Due 5pm Tuesday April 16<sup>th</sup>.

1. (20 points) For this assignment I would like you to expand on the state machine and pseudocode of HW #3 and HW #4. I would like you to think about the state transition diagram for collecting a brightly colored blue golf ball or a brightly colored orange golf ball. The vision code you will be learning will be able to easily find these two bright colors. Also in lab 7 you will program the robot to follow these bright colors. So when the robot sees one of the golf balls on the ground it will be able to drive towards the golf ball. One big issue is that you have to drive the robot over the golf ball to collect it. So in part of your state machine the robot's camera will not see the bright color. How do you handle this? Also you will want to record the X,Y position of the golf ball. When in your state machine would be the best time to record the X,Y position of the golf ball? Make sure to include your state transition diagram and your pseudocode. You may find a nice way to accomplish this task is to have a "sub" state machine inside the larger state machine you created in HW 3 and HW4.
2. (80 points) This homework assignment is up to you. (Same as HW #4 Question 9). Use your creativity to build something using one or two RC servo motors, the buzzer if you want to and one or more of the following sensors: photo sensor, MPU-9250 IMU, joystick, microphone (I will have to give you one) any other sensor you already own or want to purchase. You will be able to send me STL files that I will print on the lab's 3D printers. Make something that you will be proud of and put on your desk at home or something that will scare your friends when they try to raid your refrigerator. Anything goes but keep in mind that you also have a final project with the Robot to complete by the end of the semester. So in other words, I am not expecting it to be an elaborate and finely polished design.

Items that you **CAN** use that are in the Mechatronics Lab: *(This is not a complete list so ask if there is a part that you need).*

- a. Any of the parts (resistors, capacitors, sensors, etc) used in this and previous homework assignments.
- b. Anything (hardware, sensor, actuator or integrated circuit) that you purchase.
- c. Raw plastic and aluminum, "Super Velcro", nuts and bolts. Cheap items that can be purchased from McMaster-Carr. I will be the judge of what is cheap.

Items that you **CANNOT** take from the lab.

- a. Pretty much any of the pre-made parts for the RC servos. Unfortunately these items are relatively expensive and I can't give them to you.
- b. IR and Ultrasonic sensors used by the Robot.
- c. Gears, pulleys, belts. Ask though because I have some old ones you can have.
- d. Other items? Ask before you plan on using them.

This assignment spans both HW #4 and HW #5. Your finished product should be completed and checked off by the due date of HW #5 (April 18<sup>th</sup>).

**What needs to be turned in to Box for HW #5 Question 2.**

- a. In person demonstration your project working.
- b. All the source code you developed for this project. This source code must be commented well and copied to your HW Box folder!
- c. Take a video and a few still pictures of your final design.