EL6483 – Spring 2017

Real Time Embedded Systems Term Project Requirements

1. Project: Autonomous Parking Vehicle

   Purpose and goal:

   > To autonomously parallel and perpendicularly park a vehicle without touching the other vehicles. You will get 3 attempts. The initial starting position will be counter-clockwise facing along one of the walls.

   Equipment:

   1. Lab car kit with custom board (Available in the Lab)
      - Built in PWM motor drivers, one for each rear wheel
      - 3 Ultrasonic Sensors (HC-SR04) on front, left and right
      - Digital encoders, one for each rear wheel

   Setup:

   > Approximately a 5' by 6' closed pen, 7.5" high.

   > 2 cars placed parallel to a wall, 15" inches apart (for parallel parking). See below

   > 2 cars place perpendicular to a wall 12" apart (for perpendicular parking). See below
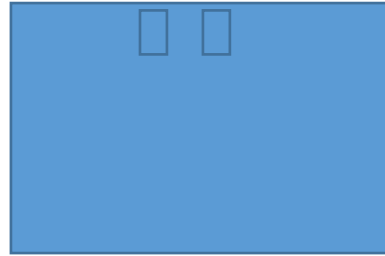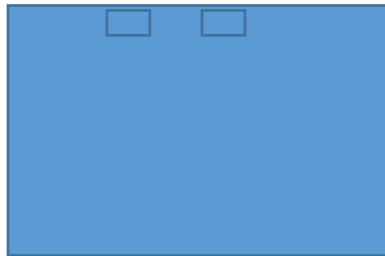
   > Note: In both cases, setup cars will be against the wall.

   Grading (50)

   (20) Successful attempt at parallel parking without touching another vehicle or wall

   (20) Successful attempt at perpendicular parking without touching another vehicle or wall

   (10) Smoothness and elegance of vehicle control

   Partial credit will be given for all three parts (i.e. if the car parks but contacts another vehicle)

2. Project: Autonomous Vehicle Exiting Maze

Purpose and goal:

To autonomously find the exit of a pen with obstacles (maze). You will get 3 attempts. The initial starting position can be anywhere in the maze.
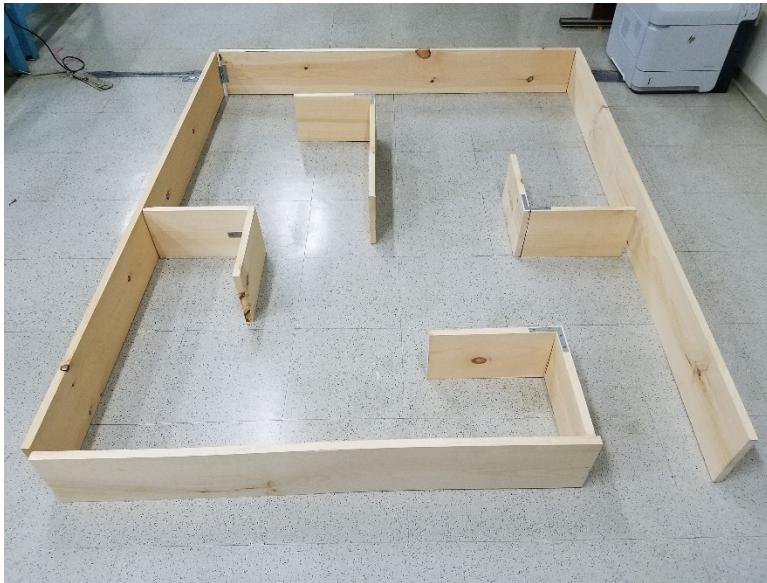
Equipment:

1. Lab car kit with custom board (Available in the Lab)
   - Built in PWM motor drivers, one for each rear wheel
   - 3 Ultrasonic Sensors (HC-SR04) on front, left and right
   - Digital encoders, one for each rear wheel

Setup:

Approximately a 5' by 6' pen, 7.5" high with an approximate 15" opening.

See sample below:

Note: Obstacles may be placed in a different orientation.

Grading (50)

(20) Successful navigation in the maze for 2 minutes (or until successful exit within 2 mins) without touching a wall or obstacle

(20) Successful attempt to exit the maze

(10) Smoothness and elegance of vehicle control

Partial credit will be given for all three parts.

3. Project: Heart Rate Monitor with Pedometer

Purpose and goal:

>   To measure both heart rate using the Amped Pulse detector and step rate using the accelerometer included in the STM32 F3 board. Both the heart rate and step rate are then sent wirelessly (Bluetooth with UART) to a PC or Phone and then displayed in real time showing the correlation of the two measurements in graph form.

Equipment:

1. Amped Pulse Sensor (https://www.adafruit.com/products/1093) Available in the lab:

2. Accelerometer on STM32 F3 (LSM303DLHC - See Reference Sheet)
3. Serial Bluetooth Module (https://www.sparkfun.com/products/12580) Available in the lab:

4. PC or Phone: Student Provided

Grading (50)

(15) Successful calculation of heart rate from the pulse sensor

(15) Successful calculation of step rate from pedometer

(10) Successful wireless transmission of both calculations to PC/Phone Device

(10) Implementation of display for measurements on PC/Phone Device

Partial credit will be given.