**ELE 302 – INDEPENDENT PROJECT INITIAL PROPOSAL**

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(Bench 207)

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# 1 Overview

- **Objective:** To build a robot/car capable of playing basic ping pong
- **General principles:**
  - We will use a camera (or two for stereoscopic vision if necessary) to track a ping pong ball and estimate its trajectory.
  - We will then move the robot to the required location (ideally using omni wheels or Mecanum wheels) and hit the ball back over the net.
  - We will use a combination of dead reckoning and a grid laid on the floor to determine the position of the robot

# 2 Progress steps and checkpoints

## Hardware

**(1)** Move around with new drive system (build H-bridges and other relevant circuit boards as necessary)

**(2)** Track position of robot with grid and dead reckoning (with accelerometer and gyro)

**(3)** Set up interface between camera and primary processor (either a Raspberry Pi or an Arduino) and PSoC

**(4)** Set up interface between primary processor and PSoC

## Software

**(1)** Set up feedback control to execute movement commands

**(2)** Determine the location of a static ping pong ball based on camera $x/y$ coordinates and ball size

**(3)** Predict the trajectory of a moving ping pong ball based on camera measurements

**(4)** Calculate position to move car to in order to hit ping pong ball

## Intermediate goals

**(1)** Execute movement commands and track position

**(2)** Track ping pong ball and rotate to face ball

**(3)** Predict ball landing position $X$ and move to point $X$ in a non-time-dependent manner

**(4)** Track ball and move so that the ball hits the robot's paddle after one bounce

**(5)** Track ball and move to hit the ball back over the net after one bounce

## 3 Parts list

- Omnidirectional drive, ideally able to move sufficiently fast (2-3 feet/second)
  - If possible, the omni chassis from last year, or an equivalent one from the same vendor. We may need to gear up the motor if necessary
  - Four H-bridges (lots of transistors)
- Raspberry Pi 3 (or perhaps an Arduino?)
- Pixy CMUcam5 (maybe two for stereo vision)
- Accelerometer and gyroscope
- Light sensor (either C-Cam-2A or photoresistor with bright LEDs)