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 interfaces between camera, accelerometer/gyroscope, primary processor (either a Raspberry Pi or an Arduino) and PSoC

(4) Set up paddle for hitting ping pong ball

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)

- Paddle (any hard, flat surface that a ping pong ball can bounce off)