**Self-Driving RC Car**

**Evan Fabry (efabry2), Harshit Agarwal (hagarwa3), Moderator(s): Charlie Martel, Rishabh Jain**

* **Abstract**
  + **Project Purpose**
    - In this project we will create a self-driving RC car
  + **Background/Motivation**
    - We have researched Computer Vision algorithms before and have some experience with point cloud systems
* **Technical Specifications**
  + **Platform:** Python on a raspberry pi, OpenCV or Tensorflow Convolutional Neural Network, RC car/controller, possible a game controller, possibly Arduino
  + **Programming Languages:** Python
  + **Stylistic Conventions:** function signature commenting
  + **SDK:** OpenCV or TensorFlow
  + **IDE:** Sublime text + terminal + PyCharm
  + **Tools/Interfaces:** camera, RC car, json settings, local SSH
  + **Target Audience:** Prospective employers, tbh

**Functional Specifications**

* + **Features**
    - The RC car will be able to drive around the room and avoid obstacles
    - Timer permitting, there will be a video feed hosted at a local IP address showing object and distance detection over the feed from the car’s camera
    - The car will make use of Convolutional Neural Networks to identify objects
    - Time permitting, the user will be able to input some direction via a game controller (semi-autonomous driving)
  + **Scope of project**
    - Limited to people with hella time to burn, a raspberry pi, maybe an arduino, a small camera, and enough technology
* **Timeline:**
  + **Week 1**
    - Figure out acquisition of RC car, Raspberry Pi (Evan owns one), small camera
    - Set up a camera feed to Raspberry Pi
    - Build or otherwise deploy a multithreaded TCP server on the Pi to accept video feed, other possible sensor feedback, and possible external commands
    - Note that the RC car is not needed at this stage
  + **Week 2**
    - Build the interfacing to control of RC car via either the Pi itself (if possible considering weight, etc.) or use an Arduino
    - Write Arduino code to accept streaming controls over serial connection
    - Interface between Python and Arduino on the Pi to control car from Python
    - Establish interfacing over Flask server to control the car remotely
    - Build testing scripts for controlling the car
    - Set up multi-threaded website to show video stream and control the car
    - Show video of testing on web site
  + **Week 3**
    - Research other classifiers and begin to train detection of individual objects
    - Begin training distance detection
    - Train basic edge detection and obstacle detection
    - Program an exploration mode that drives around and avoids obstacles
  + **Week 4**
    - Make car perform specific actions for specific objects classified (stopping for a red block or stop sign)
    - Figure out anything that isn’t working by then
    - Build in controls to let a user partially guide the system via a game controller
    - Steam video to a separate local IP address time permitting
    - Embed video in a basic page with Python and Flask (time permitting)

**Future Enhancements**

Build a video stream that shows objects detected and estimated distances, host that feed on a website, explore state of the art algorithms, train with more data, turn it into a cat toy.