**Abstract**

Self-driving is one of the hottest technology topics in the world nowadays. Replacing human drivers with machines is the future trend. Our purpose is to build an autonomous remote control car with multiple functionalities such as voice recognition and object detection which can implement a unique driving workflow for the user.

For the hardware part of our project, we will integrate the RC car, Raspberry Pi and other electric hardware essentials. And also a two-line track will be built using white ribbon for simulating a real-world environment.

For the software part of our project, we will collect images while testing driving RC car and training data using TensorFlow to optimize the self-driving decision. Voice recognition and object detection will be developed with Google APIs.

When the project is complete, the RC car will run in the track without human control and start or stop running by voice command.

**Goal**

- Construct a small self-driving remote control car with multiple functionalities
- Design a driving workflow for user
- Simulate real-world environment to optimize self-driving decisions
- Modular Functionalities and System Integration

**Acknowledgement**

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**Project Structure**

**Hardware**
- Raspberry Pi 3
- Servo Driver
- Camera
- Voice receiver / Speaker
- Wires + Controller units
- Batteries
- Cheap remote control car with basic steering and throttle

**Software**
- Implemented frameworks and Python libraries for car controlling
- Speech recognition and Object detection functionalities were integrated into the Raspberry Pi using Google Voice API and Vision models provided by Google AIY projects

**Method and Results**

**Data Collection**
- Access raspberry pi which connected to the WIFI using a laptop by SSH
- Set up a web remote control server and control Apollo manually
- Record 10k+ frames in jpg files with operation parameters in json files for training

**Method and Results**

**Model loss**

- Model were used for autopilot and successfully controlled Apollo to run laps
- Due to human errors, lack of background lights, and unclear tracks which made by white ribbons, our project data has lower quality than expected which leads Apollo sometimes ran out of the tracks by itself