

ECEN 631 – Robotic Vision

Monster Truck Project Guide

January 31, 2017

Project Scope:

This project is one of the three focuses of this robotic vision course. It is designed to introduce color image processing theory and simple path planning and their implementations through a fun real-time mobile computer vision project. This team project focuses on using an Android device to control a monster truck to navigate autonomously in an indoor environment. The objectives are to avoid obstacles such as orange cones and stay within the course boundary set by blue foam tubes.



Project Requirements:

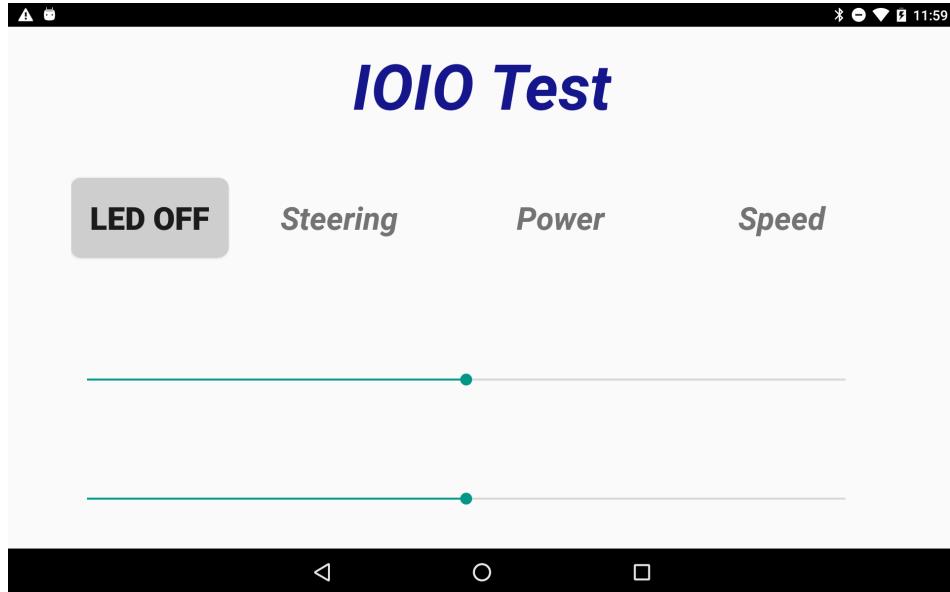
- Students will work as a team to complete this project.
- Students will learn to use Android Studio as the development environment.
- The performance will be determined by the time that it requires to complete the entire obstacle course.
- Prepare and submit an unedited video of the autonomous monster truck navigating the entire course.

Software Packages:

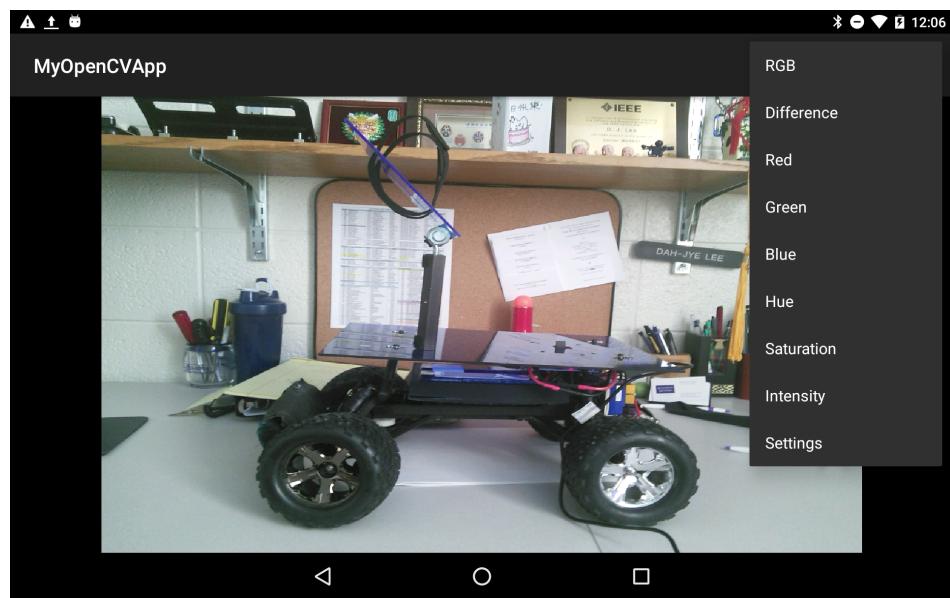
Three Android Studio projects using OpenCV 2.4.10 JAVA functions (higher versions seem to have some issues) for Android have been prepared for students to implement their algorithms. These projects include

1. MyIOIOApp : This Android project is used to test the USB connection between the hand-held device and the IOIO board installed on the monster truck. Modification to this

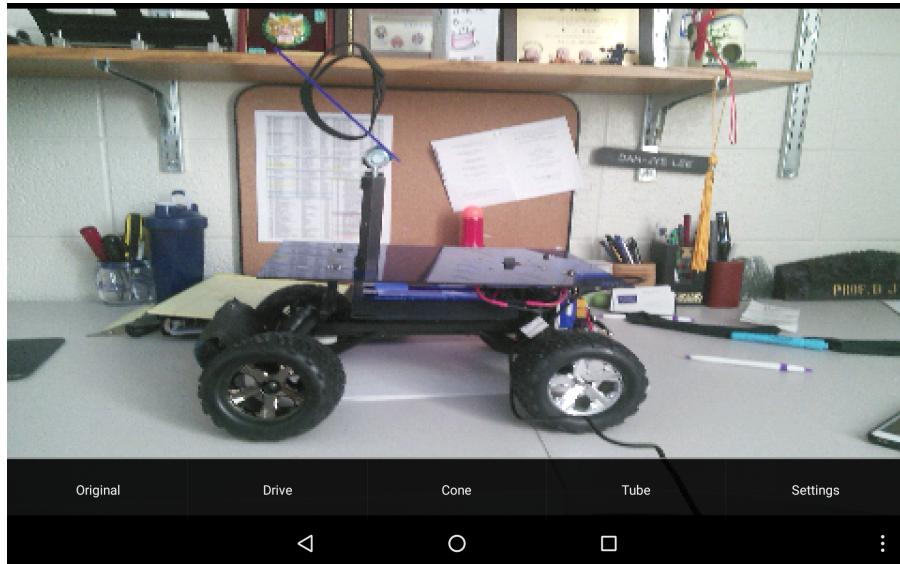
project is not required. Reviewing MyIOIOActivity.java file will help learn how to control the monster truck and how to read the truck speed in order to implement a closed-loop speed control system. Three control functions are implemented. One controls a yellow LED. One for steering the monster truck and one controls the throttle. It also includes a function to read the frequency of the wheel encoder pulses.



2. MyOpenCVApp : This Android project is used to test image acquisition function on the hand-held device. It also demonstrates how to use a few simple OpenCV functions for color image processing in JAVA and how to receive input from the touch screen. Touch screen input is useful for setting run time parameters such as image threshold and region of interest selection. Modification to this project is not required. Reviewing MyOpenCVActivity.java file will help learn how to acquire images and how to integrate OpenCV library into your project.



3. MyVisionDriveApp : This Android project combines the previous two projects . Reviewing MyVisionDriveActivity.java file will help learn how to integrate OpenCV library and IOIO functions into your project. This is the project that you should modify and implement your vision, path planning, and closed-loop motor control algorithms.



Hardware Instructions:

- You need a micro USB – USB cable to connect the hand-held device to the monster truck.
- Turn off the power switch on the truck when you don't need it.
- DO NOT remove the hand-held device mounting fixture.
- Charge the batteries after you use them. Normally, it takes approximately 40 minutes to fully charge a battery if it is almost drained.
- Connect the battery to the charger and hit the "E" button to charge it.



***** Warning *****

DO NOT leave the charger unattended when charging and NEVER overcharge the battery or leave the charger on overnight.

Software Instructions:

- Go to **Settings and then About Tablet** and click on **Build Number** several times to activate the developer mode on your device.
- Go to **Settings and then Developer options**. Under Debugging, **activate** USB Debugging to allow connection to the device from the computer. The device must be in this mode in order to be programmed (download the App to the device).
- Go to **Settings and then Developer options**. Under Debugging, **deactivate** USB Debugging to allow the device to be the master of the USB port in order to control the monster truck. Turn on the power of the truck and connect the USB cable to the truck. The following message will appear on the screen. Click “OK” without checking “Use by default for this USB accessory”.

