Application Notes

ECE 492 Capstone Project

Launch Control

2019

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# Overview of Launch Control

Launch control is an automobile data logging system that consists of the following three major subsystems:

1. Custom made PCB data collector
2. Android app that displays the collected data and uploads it to the web
3. Cloud hosted dashboard for viewing the data

The PCB is responsible for collecting values such as speed, RPM, fuel level and other performance metrics through various parts of a vehicle. This information is collected through an OBD-II interface. The collected data is then transmitted to an Android app (via Bluetooth). The app then forwards this data (through the internet) to the cloud hosted dashboard for logging and viewing.

# Overview of Hardware

## PCB

The PCB is designed to replace the breadboard, and connects a Teensy 3.6 Microcontroller with the Freematics OBD-II UART Adapter and HC-05 Bluetooth module. More on each of the hardware is listed below.

## Teensy 3.6 Microcontroller

The Teensy 3.6 microcontroller is the central hardware piece that polls and collects data from the OBD-II adapter and transmits it over Bluetooth. This is essentially an Arduino clone from a software point of view. It comes with a total of 5 UARTS, of which 2 are used (for the OBD-II adapter and HC-05 Bluetooth module). While the Teensy operates at 3.3V, it is still 5V compatible (Vin range of 3.6 to 6.0 V), and hence works seamlessly (without the need for a voltage step down) with the adapter’s power supply. The Teensy plugs into female headers on the PCB, however only 6 pins are actually in use - two for power supply, two for transmit/receive to the OBD-II adapter and two for transmit/receive to the Bluetooth module.

The Teensy uses a 180 MHz 32-bit ARM Cortex M4 Processor, which is found on the MK66FX1M0VMD18 chip. In addition to the UART interfaces being used, the chip also provides CAN, Ethernet, I2C, I2S, SDHC and SPI interfaces. The Teensy board also includes a SD card slot. These interfaces are as of yet unused by Launch Control, however they do allow expandability for future projects to work from.

Link to product: <https://www.digikey.com/product-detail/en/sparkfun-electronics/DEV-14058/1568-1465-ND/6569369>

## Freematics OBD-II UART Adapter

This adapter acts as a data source from the car as well as a Power supply, supplying 5V at up to 2.1A. The adapter connects to four male pin headers on the PCB. With two being power and ground, and the other two being transmit and receive. We are using a baud rate of 9600 bps to communicate with the adapter.

Link to product: <https://freematics.com/products/freematics-obd-ii-uart-adapter-mk2/>

## HC-05 Bluetooth module

This Bluetooth module is used for transmitting collected OBD-II data to a paired Android smart device. Totally, it plugs into 6 female headers on the PCB, which hold it in place. However, only 4 pins are actually used here - two for power and ground, and the other two for transmit and receive.

Link to product: <https://www.amazon.ca/J-DEAL%C2%AE-Wireless-Bluetooth-Transceiver-Arduino/dp/B01M248TJU/ref=sr_1_3?keywords=bluetooth+module+hc-05&qid=1552423528&s=gateway&sr=8-3>

# Getting started with the Teensy 3.6

# Getting started with the Android application

# Getting started with the Web application