

Shift Buddy

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Overview

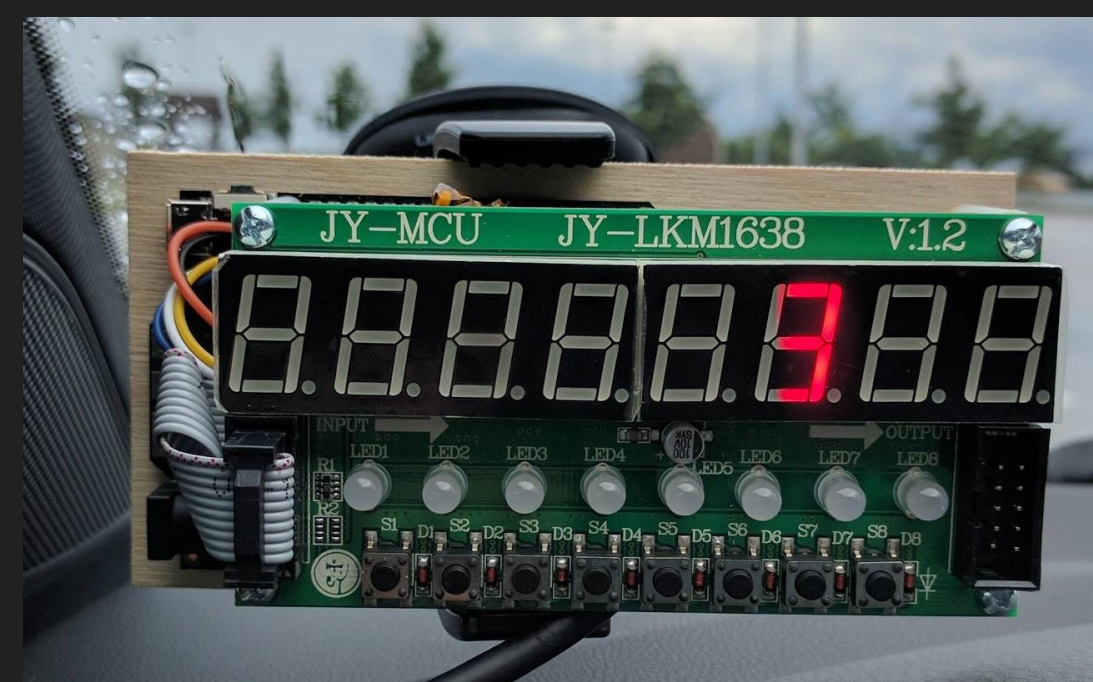
The Shift Buddy is a tool designed to help drivers learn how to drive their vehicle to the transmission's fullest potential. It works by analyzing the amount of power from the engine into the transmission and the amount of power delivered to the road in order to choose a shift point in the RPM band perfect for maximum acceleration.

The hardware used in the Shift Buddy is as follows:

- Freematics OBDII Arduino Adapter
- Arduino
- TM1683 LED/Display

Background

I designed this product as a way to help out the vehicle enthusiast community. I originally noticed a gap in the market when I found similar products offered at exorbitant prices with little customizability. This project is designed to fill that gap, it offers an open source codebase with room for customization for multiple vehicles and is designed using extremely cheap open source hardware.



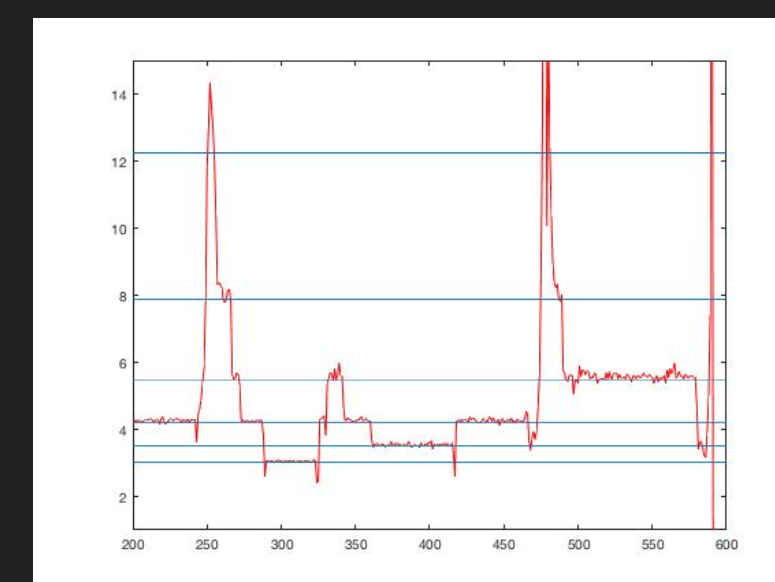
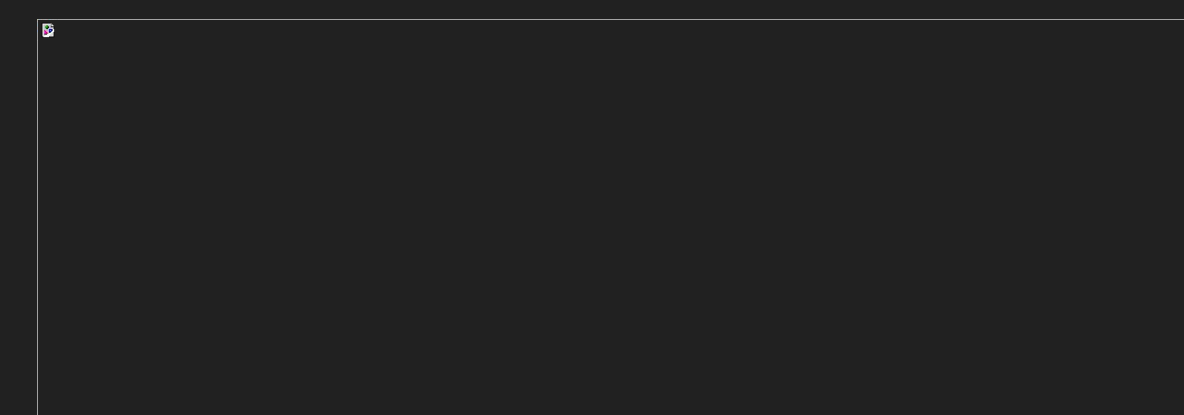
Project Objectives

- Notify driver of optimal shift point
- Customizable for multiple vehicles
- Open source codebase
- Hooks for further customization
- Open source hardware
- Affordable



Your Approach

Matlab and Matplotlib was used to for prototyping the "Optimum Shift Point Algorithm" and "Gear Shift Model".



Solution Design

The solution consists of a two-part backend, one Python backend and one Arduino/C++ backend.

Python Backend:

The Python(3.5) backend was built for offloading the optimum shift point analysis to a more powerful / interactable computer. This backend consists of a CLI for users to describe their vehicle's TQ curve and export the results into "SB Files". The SB files as a collection can be then exported into a readable C++ header onto the Arduino.

Arduino Backend:

The Arduino backend consists of logic used to talk to the vehicle as well as talk to the user-facing display. The Arduino backend uses the SB files to estimate the gear the transmission is currently in based on engine RPM, vehicle speed(km), transmission gear ratios, and differential gear ratios. It then uses this to index into the exported SB database to determine the current optimum shift point.

Deliverables

1. Hardware wiring diagram
2. Configuration Tool (Python)
3. Main hardware/sbProfile controller (Arduino/C/C++)
 - a. Codebase is designed to be loosely coupled to hardware for possible use of other hardware
4. Fully open source software
5. Documentation

Future Work

The first future improvement to be made is calculating the optimum shift point for downshifting a vehicle. Currently the Shift Buddy only analyzes the best point to shift in an increasing fashion for optimum straight line speed. A downshift model will expand the potential of this product from only straight-line racing into any form of racing (Rally, GT, etc.).

Autobiographical Info

I'm a 23 year old Computer Science student with a concentration in Software Engineering. I also possess a Japanese Language & Culture minor and take a lot of my influence from my experience abroad. My main interests are in engineering, specifically aerospace and my future goals are oriented towards working in the aerospace industry.

Acknowledgements

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