

Team 16: Envision Gforce
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Practicum Product Design Specification (PDS)

Executive Summary/Concept of Operations

The purpose of our device is to visualize the acceleration (in terms of G-force) acting upon a moving vehicle, such as a car or bicycle. This is achieved by measuring and then displaying the magnitude and direction of the vehicle's instantaneous acceleration vector. Its intended use is to collect data pertaining to the acceleration vector and display live information to the vehicle occupant. This kind of information is valuable to professional rally and track drivers as well as professional drifters, but may also be interesting to daily commuters as well (even cyclists).

By mounting the device on the vehicle with the x-axis parallel to the centerline (a line pointing in the direction of straight-forward travel) the occupant is able to see an RGB LED ring that displays the current direction of acceleration by lighting a single LED, and the magnitude indicated by the color (red, yellow, green); green pertaining to a small force. This display aids the driver in fine-tuning their control techniques and ability to consistently drift or navigate a corner without sliding off the road or flipping their vehicle.

Brief Market Analysis

Our product is intended for anyone interested in the acceleration forces experienced while driving/riding in a vehicle: from track-day hobby drivers to daily commuters.

There are multiple comparable products available on the market, but we aim to create a product that is similar in quality, but at about 80% of the average price. The products currently available on the market are easily portable and mountable, wireless, chart X, Y, and Z axes, and sensitive up to 8Gs.

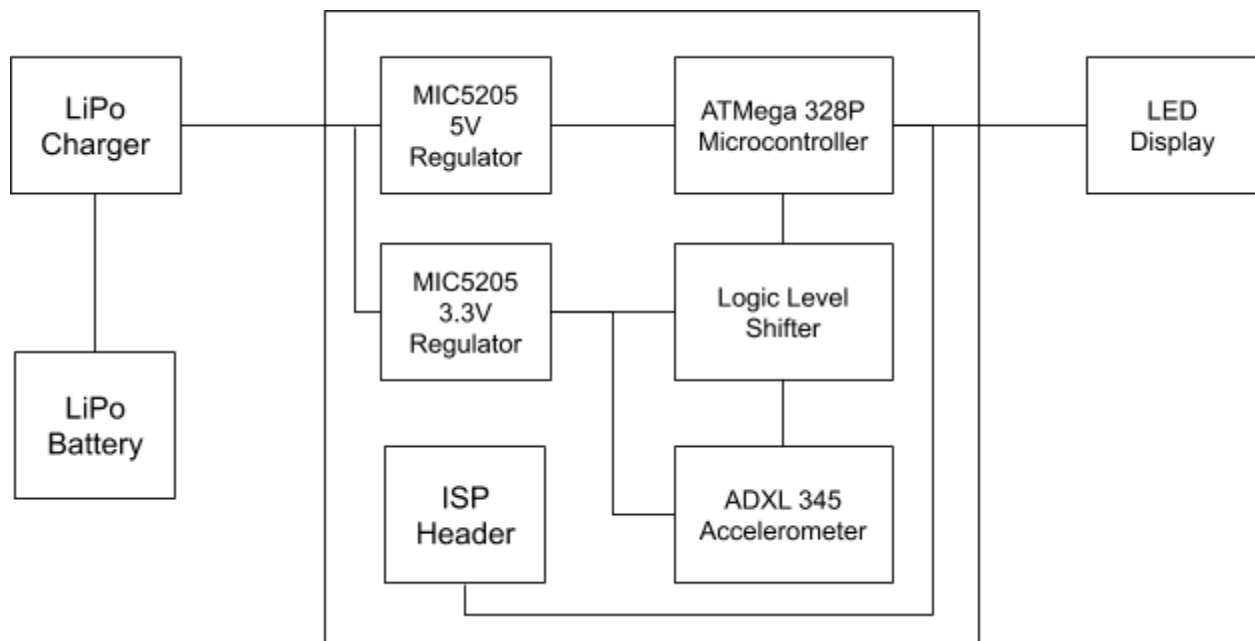
There are already products on the market for around \$120. Our goal (and competitive advantage) is to create a comparable product and offer it at a cheaper price. Current products are likely smaller than ours will be, but with ours having a higher range of sensitivity, we believe we can sell ours for around \$100 and still be profitable.

Requirements

Our device must intuitively, accurately and instantaneously convey the direction and magnitude of the acceleration acting upon the device (or a vehicle the device is attached to).

The sensing mechanism within our product must be sensitive enough to measure low to moderate G-forces, (somewhere around the 0-5G range). Our device must also be extremely portable for its intended in-vehicle applications; so it must be small, lightweight, power-efficient, and also battery-powered. The battery should have a moderately-long life of around 5-10 hours, and should be easily rechargeable.

System Architecture



Design Specification

- **Microcontroller:** ATMega 328P
- **Sensor:** ADXL 345 accelerometer
- **Actuator:** LED display (exact configuration TBD)
- **Power Supply:** 3.7V@1Ah LiPo battery (with onboard USB-C charger)
- **Firmware:** Using arduino IDE and programming with an AVR programmer