HAPTIC FEEDBACK COMPASS

REQUIREMENTS

TYSON FOSDICK

TODD TOWNSEND

RUBEN MALDONADO

MATT SCHROEDER

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ECE 411

Department of Electrical and Computer Engineering

Project Summary

This project encompasses the hardware and software design of a haptic feedback compass to assist an individual with land-based navigation. Direction will be determined with the use of a digital magnetometer and microprocessor. During operation Haptic feedback intensity will be proportional to the deviation of the end users desired direction of travel. Depending on the customer and desired application our design will accommodate multiple users creating a diverse clientele encompassing the wide range of applications.

Background

Original concept was a design for a haptic feedback dog collar to help visual impaired dogs with obstacle avoidance. This design had extreme challenges due to the unpredictable nature of the animals movement. The concept for the compass was derived from the collar project as a simplified version of the feedback device, to gain real-world tests of the components that may lead to a solution to the collar project challenges. During the product concept phase, the alternate use for the visually impaired was added to the design, as well as the concept of a web based application of the device.

Market Analysis

The product is targeted towards hunters, hikers, and general outdoors enthusiast primarily. Alternate application for the visually impaired will be implemented after thorough real-world testing and customer feedback has been acquired, and safety and feasibility have been assessed.

There are no comparable products currently commercially available, although there are a few open source projects in the maker community that are similar in build but differ in functionality. The closest our team could find was a visual display digital compass with price ranging from ~$12-$30. Analog compass price range from ~$8-$100.

The product will be introduced at a $80 price point mainly to get a quicker market share, and get useful customer analytics for future product releases. The price will be increased with future upgraded models.

Design Requirements

Design was created adhering to the following requirements:

Musts

Functionality

1. Acquired heading accurately reported to user
2. Operate on battery for a minimum of 4 hours

Performance

1. Give accurate feedback within a 5° plus or minus deviation
2. Low power consumption ~300mW

Economic

1. User interface equipped with user friendly options, reported from users
2. Navigation need fulfilled, reported from users
3. Priced within the market range for similar products or combination of products to equal functionality

Shoulds

Functionality

1. Run on battery for 8 hours

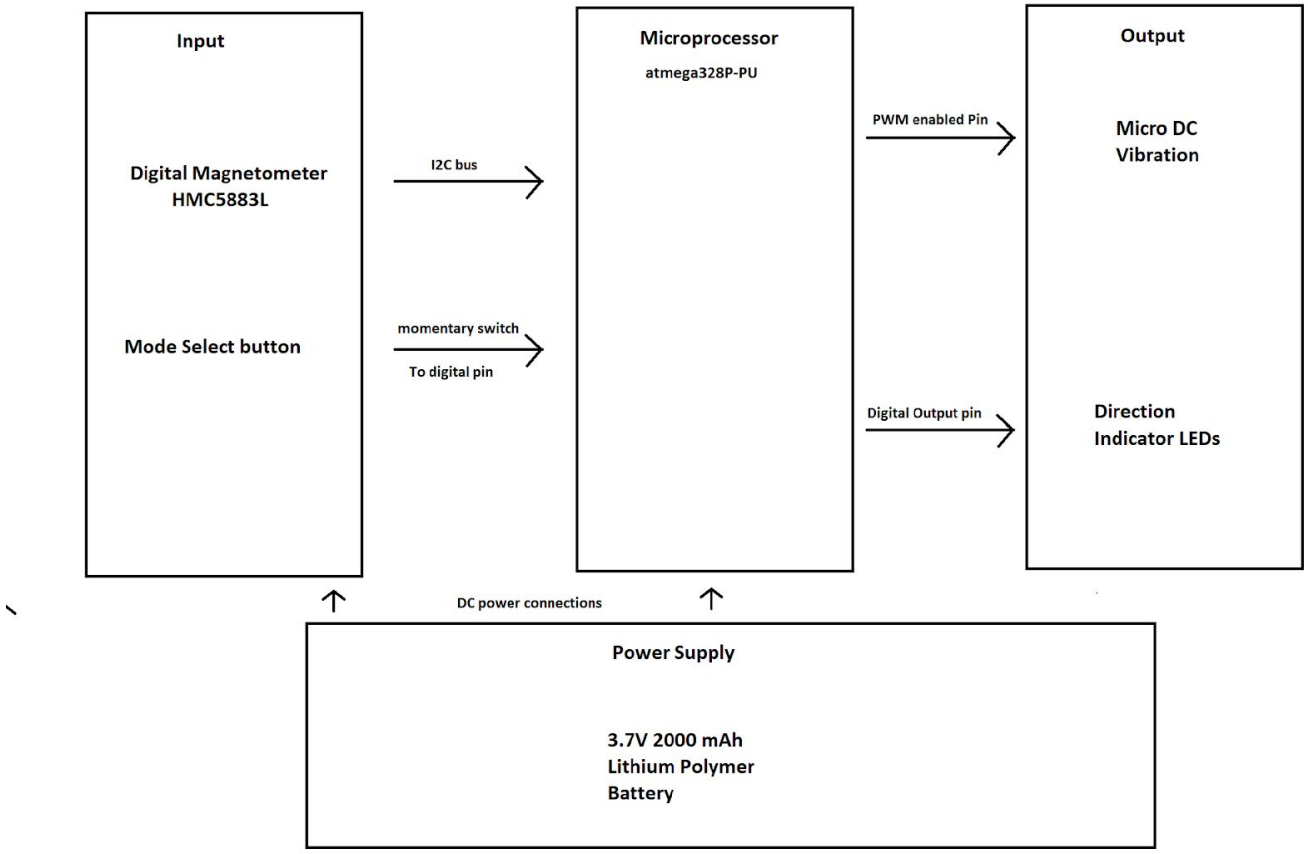
Performance

1. Have a rugged damage resistant enclosure
2. Be waterproof, cold resistant and heat resistant
3. Operate with extremely low power consumption ~160mW

Economic

1. Comfortable to wear, reported from users
2. Look attractive, reported from users
3. Cost no more than the cost of a commercially available digital/analog compass.

Architecture Overview:



Specifications:

- Processor - Atmega328P-PU with Arduino bootloader Version 3.0
- Sensor - magnetometer - P/N HMC5883L
- Actuator - Micro DC vibration motor 3v 85mA
- Power Source - 3.7v 2000mAh Lithium Polymer pouch cell
- Programming environment - Arduino IDE/Visual Studio Code
- PCB schematics - Eagle CAD
- Enclosure - Printed ABS plastic