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ECE:411 Project Proposals

PROJECT IDEA: "NORTH BY NORTH-WAIST"

A haptic feedback solution for magnetoception in humans.
Product: A wearable belt that has the capability to detect which direction the user is facing. Small, low powered vibration motors will gently pulse in the direction of magnetic north in order to provide the wearer a constant awareness of the four cardinal directions. Many applications include: extended wilderness hikes and other outdoor activities or assisting the blind.

Hardware involved:

- 1x Magnetometer
- 4x vibration motor (North South East West)
- 1x haptic/vibra driver
- 1x microcontroller
- 2x switch/buttons for ON/OFF, and different vibration pattern modes/vibration intensity?
- 1x source of power.

Ideally, the buckle of the belt would house the main pcb and sensor unit, the only wire leads leaving the main buckle area would be for the 3 other belt motors, and could be easily reinforced and shielded.

links
HMC5843 3-axis magnetometer IC url

selection of small wire-lead vibration motors

310-101 QFN vibration motor

DRV2603 - haptic driver to remove burden of constant pulse signals from the microcontroller

Software involved:

- calculating the compass heading in degrees is fairly straightforward and only uses Hx,Hy output readings of the magnetometer.

Direction $(y > 0) = 90 - [\arctan(\frac{x}{y})] \cdot \frac{180}{\pi}$
Direction $(y < 0) = 270 - [\arctan(\frac{x}{y})] \cdot \frac{180}{\pi}$
Direction $(y = 0, x < 0) = 180.0$
Direction $(y = 0, x > 0) = 0.0$

Correcting for the appropriate declination angle, you can just subtract 20 degrees (Only works in Portland,OR and surrounding areas)

- using the driver, outputting PWM signals at varying intensities.
- based on the direction, say NW, should two sensors be pulsing at the same time? Routing the voltage to the correct motors, based on the poll rate.
- calibration of the sensor.

links
Compass heading using magnetometers

Calibration article: A fun read on calibrating the sensor to compensate hard iron distortions.