Hydrocephalus is a medical condition characterized by an abnormal accumulation of cerebrospinal fluid (CSF) in the ventricles of the brain. This excess leads to increased cranial pressure, swelling, among other complications. Medtronic recently released the StrataMR shunt valve, which resists unwanted performance level change during MRI imaging. One drawback of this was that the locator tool used to find the center of the valve no longer works. Our electronic magnetic center finder helps to find center and find the pressure setting of the valve using only one tool.

Background

The performance level (pressure setting) of the Strata MR is set by adjusting a small magnetic rotor inside the valve. However, to accurately do so, the adjustor tool must be within 1 cm of the center of the magnetic rotor. This is due to the added measures to prevent the rotor from inadvertently moving while the patient undergoes a MRI. There must be a non-invasive way to determine the center of the rotor so that adjustments can be easily made without putting the patient into surgery.

Problem Overview

Our product, the Bullseye, is an electronic magnetic center finder which also serves as a performance level (pressure level) indicator.
- LEDs to note performance levels
- LCD Display
- Simple Graphical User Interface
- Fits in current indicator tool

Hardware / Key Components

Sensor Board
The sensor board has four mounted MAG3110 sensors used to sense magnetic fields emanating from the magnetic rotor in the valve.

Control Board
The control board has two multiplexers to rapidly switch between the sensors for data aggregation and an Arduino Pro Mini for data and display processing.

Display Board
The display uses a Nokia 5110 monochromatic display as well as five white LEDs to display the five discrete performance level settings.

Critical Design Specifications

Required:
Centering - 1.0 cm Radial Tolerance
Centering - 9.6 mm Vertical Tolerance
Physically Compatible with Current Locator Tool
Non-Text Based Graphical Display

Additional:
- Directional Guidance
- Performance Level Determination

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