CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

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Project Number

34446

Project Title

A Wearable Device for Spinal-Lumbus Modeling to Recognize and Correct Posture through Real-Time Flex Sensing Analysis

Abstract

Objectives/Goals

The purpose of this project is to build a belt that could be used by anyone who wants to correct their posture. Since reminders from parents are not always available, the belt should be able to recognize a user#s posture and in real time display if they need to correct it and provide useful statistics. The algorithm should be able to convert flex sensor angle measurements into degrees and collaborate with the JavaScript to depict a user#s posture on a webpage. The engineering of this belt should give users the freedom of adjusting their posture independently.

Methods/Materials

The major equipment used by all designs are shown below:
Raspberry Pi, Flex Sensor, Battery Pack, USB connector, Breadboard, PiCobbler, Ribbon Cable, 1uF capacitor, 3D printed compartments, Wi-Fi router, Band/Strap.

Three sets of procedures were created to test out my belt at different design intervals. One procedure was conducted to find the values in an array to later find a trend to improve the degree#s accuracy. After this, I tested for the degree#s accuracy by using a protractor. And lastly, a stopwatch was used to measure the amount of delay it took to display the user#s posture on a webpage.

Results

The analysis of my data started with plotting the first procedures data on a line graph. I noticed a trend and was able to improve my algorithm to return accurate degree readings. This was then tested by the second procedure that showed the algorithm to be very accurate at forward bends(0-30 degrees) and a little less accurate at backward bends(-10 degrees) but this didn#t affect the reading of posture. The last analysis of the speed delay pulled out an outlier, which was at the beginning of the testing showing that at startup the webpage is slightly slower. The average speed delay was 1.812 seconds.

Conclusions/Discussion

All engineering goals were satisfied at the end of enhancements but more could be added to the project such as Bluetooth connectivity, vibration alarms, and auto-calibration. However, this belt successfully accomplished my goal of giving users the freedom of correcting their own posture.

Summary Statement

My project aimed to create a wearable belt using flex sensing capabilities for anyone who wants to correct their posture via a stick figure animation and statistical analysis.

Help Received

Dad helped me understand RC circuits; Brother helped connecting the backend and frontend; Mr. Dave from makexyz.com provided assistance during 3D printing.