Soni-Gown Specification (Work in Progress)

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Overview

This design document will provide necessary information to understand our specific wearable device.

Block Diagram of Device

For hardware, our device will use:

- Adafruit Bluefruit LE Micro
- Adafruit Pro Trinket LiIon/LiPoly Backpack Add-on
- Stereo 2.1W Class D Audio Amplifier
- Lithium Ion Polymer Battery - 3.7v 500mAh
- 8 ohm 0.25W Speakers
- LED indicator
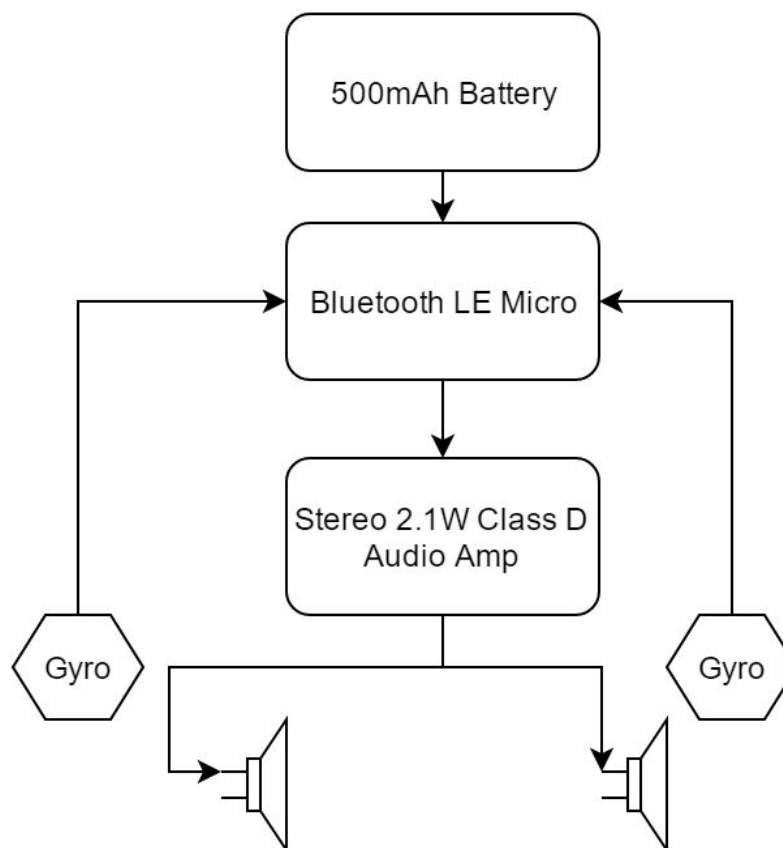
Specification

Each gown will be equipped with the proposed hardware. The main Bluetooth LE micro unit as well as the battery will be attached to the gown on the back of it right in between the shoulder blades. The two speakers will run across the shoulders and then down to the bicep where arm straps are usually located. The two gyroscopes will take the exact same path except go farther towards the forearms. The device can be charged via micro usb when not in use.

The entire unit will be sewn in between the fabric inside a waterproof plastic enclosure where the unit may be removed when cleaning the gown.

Usage of the Device

Since the device uses Bluetooth LE, you can communicate with the device with a smartphone. There, the user can modify settings such as how large the field is around them, if they will be in the sterile field during the surgery or not, etc. After this, the device will have an LED indicator to know that it is on and ready to work.

How it Works

I.   Modification to One's Needs

The SoniGown is fully bluetooth compatible. It can be connected to a smartphone device so that a user can change specific settings of the gown. As stated earlier, the gown's distance field can be changed, provide user settings such as whether or not this person is "scrubbed" in and should not leave the field, etc. You can also change the degree at which one's hands should be kept for the duration of the surgery to make sure one's hands are kept in sterile conditions.

II.   Fundamental Functionality

The gown can be charged prior to a surgery. Once it is charged, the user of the gown can set the settings on a smartphone device. Everyone in the surgery room can be wearing a gown. As the surgery goes on, the bluetooth module will be looking for Received Signal Strength Indication (RSSI) values from each of the gown. Since the personnel in a surgery room will be close to each other and there will be few obstructions, these distances should be very accurate. While this is going on, the gown will look at the distances as well as the position of the hands with the gyroscopes. The sonification of the data will be outputted on the

speakers depending on whether there is an issue with the placement of the hands or an issue with the distance of another gown.

Model of Device

The model was made using Autodesk Inventor. Each of the major components are present. In the middle is the Microcontroller, Bluetooth Module, as well as a battery. Then moving away from that we have 2 speakers, each on the side of the arms. Finally, at the forearms are gyroscope modules to make sure that the arms are positioned as needed in space.

From the back:

(Side View)

(Face View)

Sources

https://github.com/AltBeacon/android-beacon-library

Jung, Joonyoung, Dongoh Kang, and Changseok Bae. "Distance estimation of smart device using Bluetooth." *Personal Computing Platform Research Team* (2013): 13-18.