

***Department of Electrical Engineering and Electronics***

## ***Application for ethical approval for projects in which the researcher/s and the subject are the same person/people***

Jiajun Guo

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Project Title: Smart Sock - Project in partnership with Aintree Hospital

**Section 1: Description of the research aims**

The research aims must be described using language that can be understood by a lay reader. Please note that your application will be returned if the description of the research aims and design is not written in language that can be understood by a non-expert reader.

*(Recommended length: 100-200 words)*

The Smart Socks project aims to create a wearable device that uses sensors to continuously monitor ankle swelling in patients with heart failure. Because this is an important marker of decompensated heart failure, these patients are often unable to be weighed daily or are less likely to notice ankle swelling. In addition, the sock has the function of monitoring atrial fibrillation and possibly measuring blood oxygen saturation. The goal is to provide a new protocol to help patients with heart failure that is not only non-invasive, but also wirelessly provides real-time data, ensuring timely intervention when needed.

**Section 2: Description of the research activity**

The research *activities* must be described using language that can be understood by a lay reader.

(Recommended length: 100-200 words)

Our research activities began by reading the available scientific literature to understand how health indicators such as ankle swelling, heart rate, and blood oxygen saturation can be monitored by technical means. Then we selected the appropriate sensors and microcontrollers and other components. At the same time, using 3D printing technology, a round table-shaped object with a height of 10 cm and a diameter of 6 cm to 3 cm at the bottom was designed to simulate different degrees of ankle swelling. This conical frustum will help me test the accuracy of the smart sock to see if it can accurately track changes in ankle circumference. When the monitored data exceeds the normal range, an alarm will be activated to remind the user in time.

Then I will test it on myself in a laboratory environment to make sure that all the parts work properly and the data are accurately measured. Sensors to monitor heart rate and blood oxygen saturation may also be added, while ensuring that these new additions do not interfere with the main task of smart socks to detect ankle swelling. Wireless transmission is achieved through communication modules such as Bluetooth.

**Section 3: Mitigation strategy**

The text in this section should describe the strategy that you will adopt to ensure that the risk to the researcher is reduced.

The only subject in the study will be myself, and validation with truncated cones is primarily used, so the risk to the researchers is minimal. Any potential risks to researchers during the project are expected to be minimized by adhering to the following strategies:

1. All components and selected sock materials will be soft and safe, and it will be tested to ensure skin friendliness before use.

2. The investigator will ensure that there are no exposed electrical components that could pose a risk of direct skin contact.

3. The truncated cone used for testing ensures a standardized, controlled, and risk-free method of simulating ankle swelling, thereby eliminating the need to physically test the patient during the initial phase.

4. All data will not be stored in any platform or file, wireless transmission will be carried out using Bluetooth, and the microcontroller will not be connected to the Internet, so there will be no data leakage during the whole process. At the end of the project, the data will be deleted and will not be shared with others.

Student Signature: Jiajun Guo\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: 2 Nov. 2023\_\_\_\_\_\_\_\_\_\_

Supervisor Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_