Project Deliverable F:
Prototype I and Customer Feedback

GNG 1103
Group C6

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1. Introduction

The objective of this deliverable is to devise a test plan, develop our first prototype, and get customer feedback on your prototype. In this following deliverable, our first prototype will be discussed along with its feedback. We will also present our prototype test plans. These plans will include the concept we are testing along with the purpose and method of testing. Next, we will do an analysis of the prototype plans. Additionally, we will share the feedback that we received from sharing our first conceptual prototype and the first development of the Android application. Lastly, our finished prototype I will be presented, which is a conceptual prototype. This deliverable will contain the project's first prototype and application development along with its test plan and feedback.

2. Design Concept

In the last deliverable, we analyzed and planned out what we will do to create our prototypes in time and ensure we will deliver good quality work. In our last meeting, Daniel was given the task to design the box which we will use as a guideline for creating our prototype. The design and planning of this box can be seen in Figure 1.

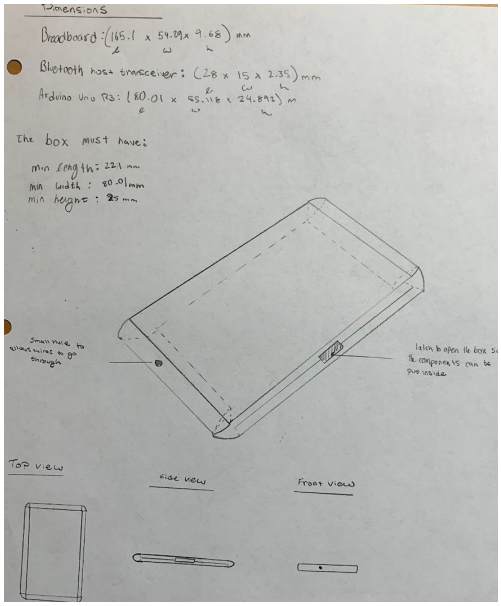

Figure 1: Design Planning of Box

For our prototype I, that will be further discussed under the Prototyping Test Plan and Analysis header, we did not create the actual box that Daniel designed. However, we will develop it by 3D printing it and using Solidworks in our upcoming prototypes when our group has a greater knowledge on how to laser cut and 3D print. For the prototype that we will present in this deliverable, we used a Raspberry Pi to act as our box, which will be seen under the Analysis of Prototype header.

In our last meeting also, Viktor was given the task to start on our Android application. The early developments of this application can be seen in Figure 2. We hope to improve on the design of the application by getting ideas and feedback from other people.

3. Prototyping Test Plan

3.1 Purpose of Test

In prototype I, we will create a conceptual design for our overdose device. This would include a prototype of our box and a prototype of our earphone sensor. The main objective of this prototype is to see if potential users understand our ideas of the problem easily and get feedback on our design of the product and understand what can be improved.

3.2 Test Objectives Description

The following list below are the things we want to test.

- If the device fits comfortably in the pocket of the user
- If the sensor detects the blood oxygen level of the user accurately
- If the device can contact the app in the case of an overdose
- If the app can send a message when the overdose is occuring
- Reduce Risk
- Reduce uncertainty
- Receive feedback

3.3 Possible Types of Results

- The device does/does not fit in any of the users pockets
- The sensor does detect the blood oxygen level and it is/is not accurate
- The app does/does not send a message when the user is overdosing
- The device can/ can not connect to the app when an overdose is occuring

3.4 Criteria for Test Success or Failure

- Trials will be used to test the sensor. If the trails produce a consistent set of results that don't deviate too much from an average person's resting oxygen levels then the sensor works.
- Trials will be used to test the sensor. If the trails fail to produce a consistent set of results that don't deviate too much from an average person's resting oxygen levels, then the sensor doesn't work.
- To test the success of the app ability to send texts we will electronically induce an overdose and if the app sends a message then it works. If the app fails to send a message then it doesn't work.
- To test the success of the device ability to connect to the app during an overdose we will electronically induce an overdose and if the device connects to the app then it works. If the device doesn't connect to the app then it doesn't work.
- To test the device's ability to fit inside of pockets the device will be placed inside of different pockets if it goes in then its a success. If the device doesn't fit inside the pockets it's a failure.

3.5 Testing Process

After purchasing the sensor and wires, we will code a software that will display the sensors result using and the arduino IDE. With the results from the the testing, we will determine at what location on the ear the sensor works best. Once that test is complete, a second test where the ESP32 will connect via bluetooth to the app will occur. This will test the communication of the ESP32 with the app to ensure it works reliably.

3.6 Cost of Prototype I

In the last deliverable, we also decided which parts we will use for our designs and who will be getting. But because this is only our first prototype, the group has not obtained all of our design parts yet. Below are the parts that we used to create our basic conceptual design and its price.

- Raspberry pi, - 30$
- Headphones - 5$

3.7 Work to be done

There are still many things that our team has to work on in order to develop future designs. Below is a list of work to be done by our group which will also be put into our update

Trello cards and Gantt chart. In our upcoming meeting, we will assign these tasks to specific team members.

- We need to do self-learning on the microprocessor that we are using so that we can properly integrate into our design.
- Further research needs to be done on how to connect the device to the app
- Further research needs to be done on the how the sensors will detect potential overdosing
- The box must be designed using solidworks and used for 3-D printing
- The proper dimensions of the box must be established in order for it to be able to properly store all the components and be able to be held in pockets.

4. Analysis of Prototype Test Plan

The prototype I is a conceptual prototype created to help the group showcase ideas to the clients in the form of a physical and interactive way to get feedback and constructive criticism. The first prototype is conceptual because of the group's lack of knowledge on 3D printing, coding, arduino boards, bluetooth, gps, and all other technical technological aspects.

After the completion of the first prototype, we still have no proof that the device works properly, however the prototype was validated by the expert feedback received straight from our clients. By having a conceptual prototype, we were able to receive crucial feedback from our clients without having to develop our knowledge on the previously mentioned topics in a short amount of time.

All user interface aspects of the project are interactable in the prototype I however they do not have any relevant outcome. The purpose of this prototype is purely to receive valid feedback on the design aspects and ideas that our group has implemented. Further analysis will be taken in future prototypes.

5. Analysis of Prototype

5.1 Application

We designed an app that would be simple to use and appealing to look at. It is key to have users properly acquainted with the app as it will lead to the most effective results. The number in the middle of the screen represents the user's oxygen saturation levels. The app is color coded to help with recognition of urgent events, such as the bluetooth not being connected or the oxygen saturation level dropping below the acceptable range. There is a settings menu to

allow for customization, like changing which phone number to contact during an emergency or changing the bluetooth name of your device.

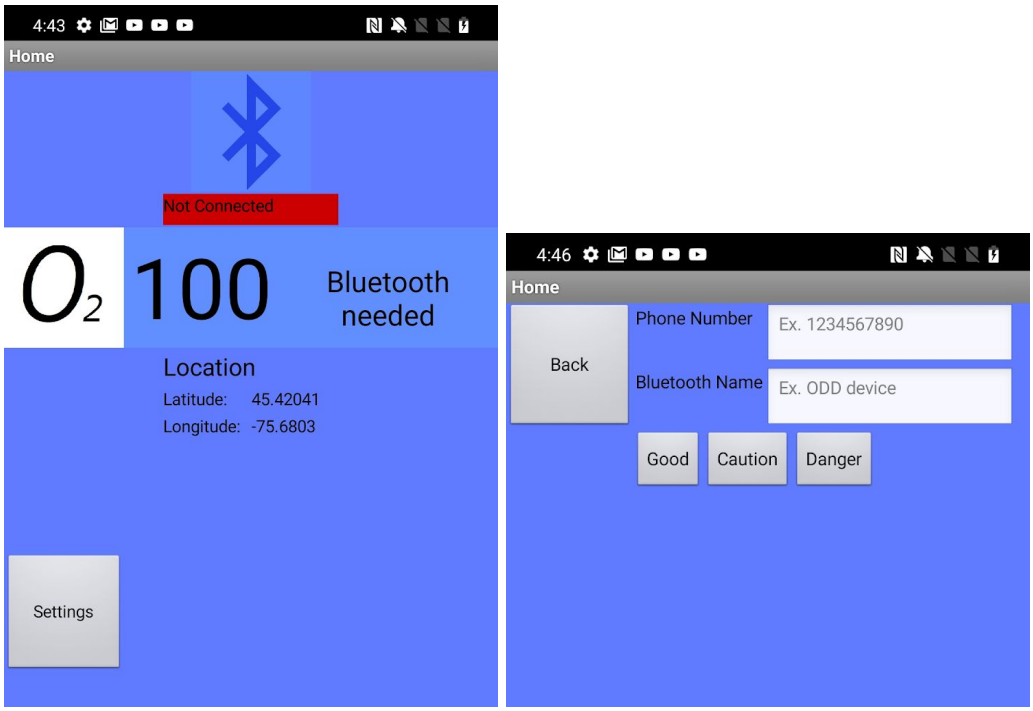

Figure 2: Android Application

5.2 Device

Currently, we plan to use a design that utilizes a sleek headphone design because it allows for the user to have full use of their hands and is unobtrusive. This was decided with the help of our first client meeting when three different prototypes were presented. The headphones will connect to a small box that contains the necessary components to detect and overdose and will be able to fit in a standard pocket. Currently we plan to 3D print the box so that the box can comfortably contain all the components. Our conceptual prototype can be seen in Figure 3 below.

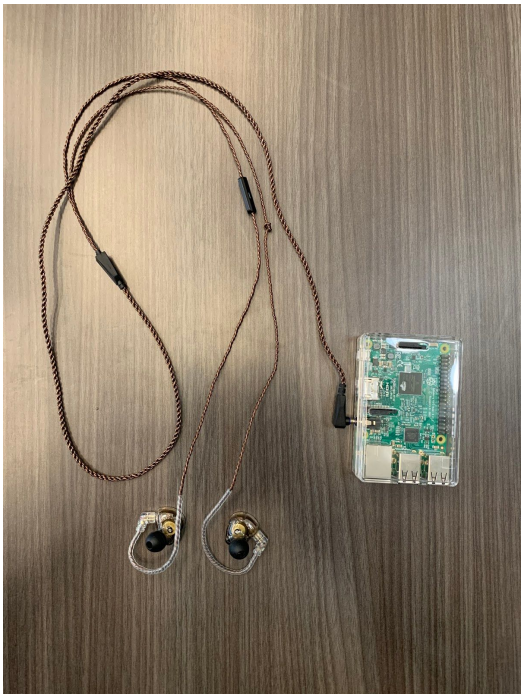

Figure 3: Prototype 1 Conceptual

As seen in Figure 3, our prototype I is very conceptual as its purpose is to see our ideas are easily understood by potential users. The box from Figure 1 is not developed yet, but the Raspberry Pi shown in Figure 3 acts like it is the designed box that our group will 3D print soon.

6. Feedback

5.1 Feedback for Conceptual Prototype

Client #1 & #2:

When we presented our first conceptual prototype to Client #1 and #2, they liked that our prototype has a main box/hub for the ear-clamp to be connected to. It was also suggested that the idea of an interchangeable model with the ear-clamp and glove would be good as some patients would prefer a different accessory if they are not comfortable with the ear-clamp and. They also liked the idea of having earbuds with the ear-clamp would be a good idea as it can provide an intervening sound for the patients if they are overdosing.

5.2 Feedback for Phone Application

CEED Employee #1:

- It’s really good and states the info well

- Keep it simple
- Could put a legend on the main screen that tells the user what different blood oxygen level ranges mean
- Maybe have a customizable standard blood oxygen level

CEED Employee #2:

- UI seems ok
- Change the text to white, might be cleaner than black
- Colour-coded is the best way to display the state of the user
- Might want to put a pop-up when the user's blood oxygen level is low

7. Conclusion

In this deliverable, we presented the early developments of our Android application and our conceptual prototype. We also received feedback for our application and conceptual prototype from our Clients and the CEED employees which will help us to improve our current developments and use it as a guide for our upcoming prototypes. We also discussed how we can test our sensors, which we will develop in our upcoming prototypes. Now that we have finished our first prototype, we will be moving forward with our second prototype and continue to improve our application. Our second prototype will be an analytical prototype to test the sensors and our application.

As we learned from our previous deliverables, we know that it is important to continue to plan out our procedures and assign specific roles to each member. Our planning in Deliverable E was used in this deliverable to ensure what each team member were doing and when to complete it by. The tentative plan and tasks have been modified as we now received new ideas and feedback from people. Therefore, with the submission of this deliverable, our Trello and Gantt chart will be updated to show a more accurate division of tasks as our upcoming prototypes will be harder to develop than our initial conceptual prototype.