Wio Link For SVH

GNG 2101 - Deliverable D

Submitted by Team E24

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Introduction

The purpose of this document is to update our original design and generate our first prototype to enhance our knowledge of the system. In order to accomplish this, the previous client meeting must be revised to determine what must be changed. Next, the design may be updated to meet the requirements. Additionally, the product assumptions must be defined to assure that the prototype can be made under current circumstances. After this is complete, the prototype can be made, and testing can begin. Accordingly, the next client meeting must be outlined and the bill of materials must be made for any of the budget spent. This document will outline each of these individual tasks and create a clear plan for the future.

Client Meeting 2 Summary

The focus of the second client meeting was to clarify the desires of the client, and expand on how each section should be implemented. With this in mind, there were a few major sources of concern, these include:

1. What are the desirable sensors to be used?

The client explained that the sensors that the hospital has been using, or have used in the past include distance sensors, sound sensors and touch sensors (buttons). However he emphasized the use of distance sensors greatly. Similarly, he said that ideally we should only focus on two types of sensors because we are limited on time.

2. How should hospital patient users be able to interact with the interface?

Hospital patients will only be able to access the call nurse and television controls. Only the nurses will be able to access the programming section that allows for sensor selection.

3. What interface programs should be prioritized?

With our limited time, the call nurse component will be prioritized because it is essential to safety. Similarly, the sensor selection method will be adaptable in the most efficient way possible.

4. What equipment is readily available at the hospital currently?

The hospital currently has many infrared signal receivers, therefore the design will be made using IR signals to relieve further costs and simplify implementation.

This newfound information will help to develop our first prototype along with any further issues we may face.

Updated Design

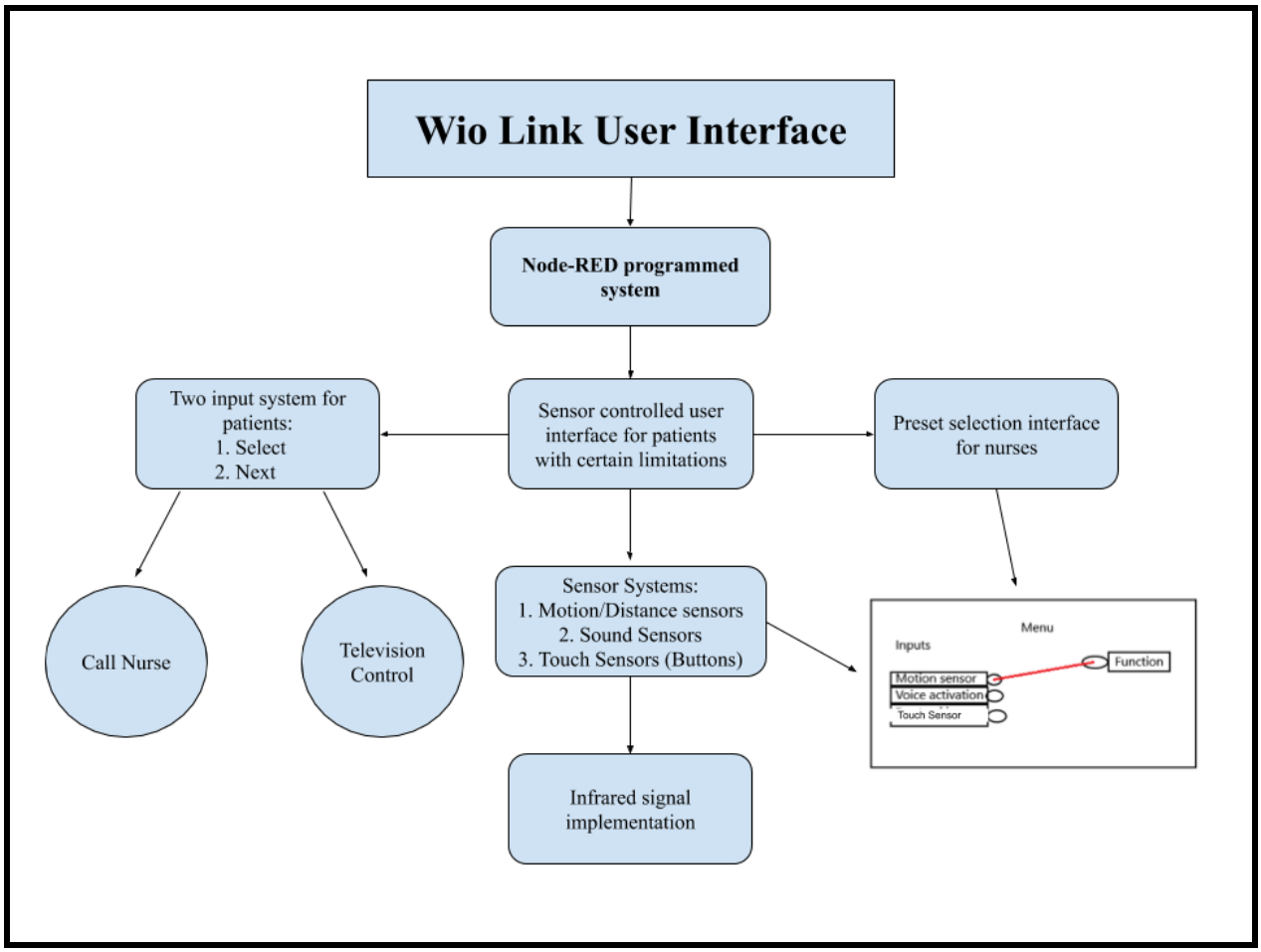

Figure 1: Updated Design Flow Chart

Simply put, node RED is an application that allows for conventionalized coding and programming. Using this software gives us the option to make quick updates to our project and add or delete certain aspects. Its simplicity will also give the hospital the opportunity to make any changes later on. Node RED also functions rather well with signal receivers and sensors to accomplish tasks, which in this case is ideal. Accordingly, our system uses node RED as its foundations to accomplish the following design tasks:

1. Sensor controlled interface

In order for people of all conditions to be able to control their surroundings, the user interface will use sets of sensors to control pre-existing inputs. The interface uses three possible types of sensors for diversity purposes, these sensors include:

a) Motion/Proximity Sensors

Motion sensors are used to detect a specific movement from the user, and translate that to a specific command. Whereas proximity sensors detect the distance between the sensor and a given object, thus allowing inputs to be given to certain extremes of distance (close or far).

b) Sound Sensors

Sound sensors are essentially voice activated commands given to the user so that they may speak to the receiver to accomplish a specific task.

c) Touchpad Sensors

Touchpad sensors follow the same simple concepts that a tv remote uses. It can be used through basic contact with whatever task the user would like to accomplish.

In order to accomplish each of these tasks, the sensors will use infrared signals due to the current system being used at the hospital, therefore eliminating cost and simplifying implementation. Infrared sensors work exceptionally well when it comes to physical sensory receivers. Similarly, this will prioritize the use of the motion, proximity and touchpad sensors.

2. Two input system for patients

The interface system is controlled by two simple inputs, “select” and “next”. The “next” option will allow users to scroll between all options displayed on their screen. Additionally the “select” input will allow the user to choose which application to open. With this in mind, the available applications given to the patients are “call nurse” and “television control”. The “call nurse” application is used to alert any nearby health officials of an emergency with a patient's vitals. The “television control” application allows patients to manipulate the television using the pre-existing “select” and “next” inputs. They will be given the ability to change the volume and change the channel. These inputs will all be implemented using the sensor system, depending on each user’s conditions.

3. Preset Selection Interface For Nurses

The preset selection interface allows nurses to select what type of sensors will be used for any specific patient based on their conditions. To simplify the process, the node RED system will allow nurses to open their tablets and simply drag and connect which type of sensors they would like to use to the desired application. It’s functionality is much like connecting puzzle pieces.

Overall, this updated design meets all of the newly made requirements from the client and improves on our previous design by specifying the purpose of each individual section.

Product Assumptions

Before beginning the first prototype phase, we must identify the major assumptions we are making while developing our product:

1. There is a need for a “call nurse” button. This button is a direct demand from the client for emergencies, since the product is for people with disabilities.

2. There was a need for a multi-usage tool to limit the number of remotes/controllers/keyboards that the patient has to use in order to accomplish different tasks.

3. There was the need for IR technology, to facilitate the introduction of the product, since the hospital already has many IR receivers.

4. There was a need for a simplified program to enable anyone to use it without any prior training.

After referring to these, we are able to define the following assumptions about our product that cannot be confirmed as of now:

1. We assume that there is already a system that will alert nearby nurses for aid at the hospital that we can connect to.

2. We assume that our IR receivers are much like the ones currently at the hospital.

3. We assume that clients have some sort of small movements available to them.

4. We assume that nurses have basic technology knowledge.

Prototype 1

In order to properly demonstrate our first prototype, we have created a short video displaying all of its features. Click the link below to watch the video:

https://youtu.be/lxSr-98eg0o

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The low fidelity prototype was coded using Node-Red in order to ensure simplicity within the design. The interface has a simple two menu function. The first menu is the client's interface; it displays a "call nurse" button, a technical support button and the option(s) pre-selected by the nurse to fit the needs of the patient. In the second menu, the nurse can select the prefered input through the provided sensors, depending on the patient's needs. For now, the interface is very easy to use and simple to understand. The program is still easily customizable, allowing 3 different inputs at the moment, without limitations. The purpose of this prototype was to somewhat prove all assumptions above except the third.

Since we only have a software based prototype, not all of the target specifications could be confirmed, however we are able to review a few. To begin, the cost has been determined in the following bill of materials. The cost was determined through our prototype and looking ahead towards what would be needed to construct the remaining prototype. With this in mind, we were able to stay under the $50 budget. Similarly, we are able to confirm its ease of use through the basic interface created for both nurses and patients.

Additionally the aesthetics of the project are relatively appealing with the limited visual design capabilities of Node-Red. However, the customization quality still remains rather high as anyone at the hospital has the opportunity to add or remove any features within the system.

As a result of these conclusions, the prototype will continue to be tested, and more features will be added to progress towards the final product.

Topic	Expected Results	Actual Results
TV Menu	Patients would have access to their television using the sensors with no limitations.	Patients may control their television with limitations on channel selection.
Call Nurse	Patients can alert any nearby nurse by selecting the call nurse function.	Patients can alert any nearby nurse by selecting the call nurse function.

Nurse Selection Interface	Nurses can select which sensors are to be used for their client based on their current client by clicking and dragging the sensor and connecting it to the desired function.	Nurses can select one general senser to use for all functions based on the current condition of the patient.
Open-Ended Design	The system will allow for any changes to be made in the future by hospital workers.	The system will allow for any changes to be made in the future by hospital workers.

Table 1: Results Table

Client Meeting 3 Outline

After reviewing our design and prototype, we hope to clarify a few things with our client to enhance our knowledge of the project. For one, we intend to confirm the assumptions made at the bottom of the product assumptions section. Additionally, we will show the client our prototype and get their opinion on the current functionality of the system. The information that the client shares will enhance our product's performance.

Bill Of Materials

Part #	Part Name	Description	Qty	Units	Picture	Unit Cost	Cost
1	Wio Link	- Wio Link is designed to simplify your IoT development. - It is an ESP8266 based open-source Wi-Fi development board to create IoT applications by virtualizing plug and play modules to restful APIs with mobile APPs.	1	55mm x48mm x6.5mm		$14.00	$14.00
2	Button	- Standard 12mm square momentary button. - Great for user input on a PCB. - Breadboard friendly. - RoHS Compliant.	1	12mm x12mm x12mm		$0.67	$0.67

3	Touch Sensor	- Force sensing resistor. - Analog output.	1	N/A		$11.17	$11.17
4	IR Receiver	- Miniaturized IR receiver modules for infrared remote control systems. - A PIN diode and a preamplifier are assembled on a lead frame	2	N/A		$1.78	$3.56
5	IR Sender	- IR emitter (950 nm, 150 mA Radial)	2	N/A		$0.84	$1.68
Total			7	(Links included in references)			$31.08

Table 2: Bill Of Materials

Project Plan Update

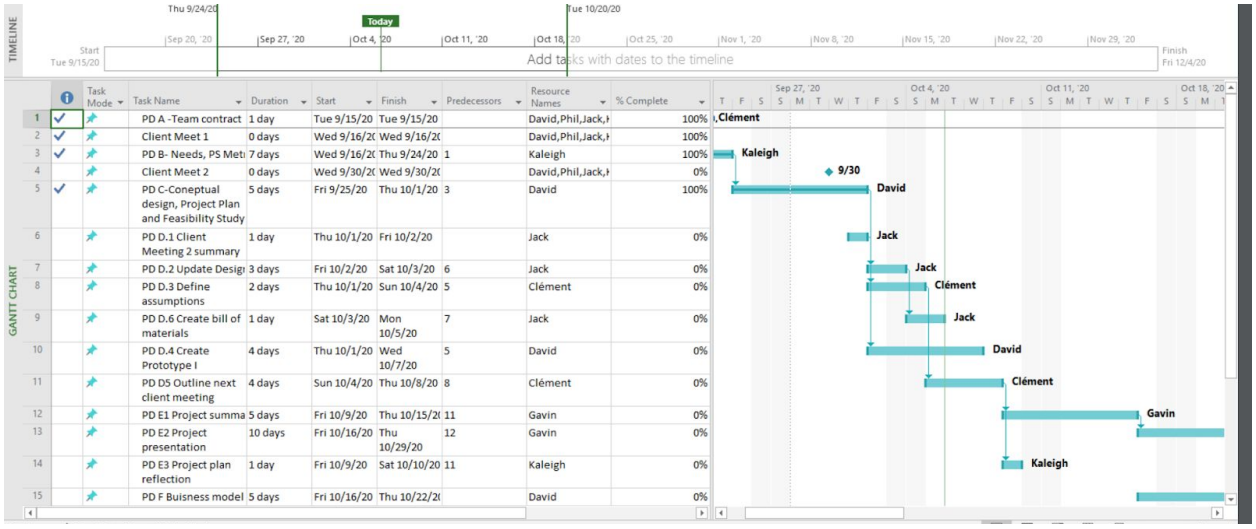

Figure 2: Project Plan

Conclusion

Conclusively, our updated design has allowed us to enhance our view of the project and improve certain aspects. With this, we were able to develop our first prototype to properly demonstrate the overall concept of our system. Subsequently, we were able to begin testing our product to determine any flaws in the system and immediately find a solution. Furthermore, a bill of materials was developed through the help of the prototype as we were capable of identifying the components needed to complete the current prototype to make a full product.

Following this, we should be able to develop a clear idea of what our overall goal is and work towards it. This prototype has pushed us closer to helping the client at St.Vincent Hospital.

References (Bill Of Materials Links)

Wio Link:
https://www.seeedstudio.com/Wio-Link.html

Button:
https://www.robotshop.com/ca/en/sfe-12mm-push-button-switch.html?utm_source=google&utm_medium=surfaces&utm_campaign=surfaces_across_google_caen&gclid=CjwKCAjwiOv7BRBREiwAXHbv3GmlQlqbCgopWG9Ahqm4AYRp-kRKiMbtw_vospYEHUufAxPft4T0UBoCTawQAvD_BwE

Touch Sensor:
https://www.digikey.ca/en/products/detail/ohmite/FSR06BE/10127623?utm_adgroup=Touch%20Sensors&utm_source=google&utm_medium=cpc&utm_campaign=Shopping_Product_Sensors%2C%20Transducers_NEW&utm_term=&productid=10127623&gclid=CjwKCAjwiOv7BRBREiwAXHbv3HAdC3svJhaM9Wx3hILPrFWKdd4Ev-0Mb1pieOTiNyFOTy_I-ThUuBoCF8cQAvD_BwE

IR Receiver:
https://canada.newark.com/vishay/tsop4838/ir-receiver-45m-950nm-sip/dp/60K6999?gclid=CjwKCAjwiOv7BRBREiwAXHbv3NMfdpxMrQO9UVAaq6i7x1mbw14ghuZACai42BUjj6Lp3NUQnHq32hoC5LoQAvD_BwE&mckv=srVDYqAk0_dc|pcrid|462047784706|plid||kword||match||slid||product|60K6999|pgrid|114068673771|ptaid|pla-947807530042|&CMP=KNC-GCA-GEN-Shopping-VeryLow-Optoelectronics

IR Sender:
https://www.digikey.ca/en/products/detail/vishay-semiconductor-opto-division/TSUS5202/4073538?utm_adgroup=Infrared%2C%20UV%2C%20Visible%20Emitters&utm_source=google&utm_medium=cpc&utm_campaign=Shopping_Product_Optoelectronics_NEW&utm_term=&productid=4073538&gclid=CjwKCAjwq_D7BRADEiwAVMDdHoYcO5dOyCvvMPuDmYcvUItDTZJUi7OjVHR3j-BsypfYZ1agjKPoVhoChoQQAvD_BwE