IOT Enabled Patient Health Monitoring and Assistant System

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Abstract: Incapacitated patients who can't talk and are helped by a wheel seat should be dealt with by their family members or by a guardian. Their wellbeing status like internal heat level and heartbeat alongside their day by day prerequisites should be checked continually. Once in a while, dealing with every single patient continually simultaneously turns into a troublesome errand for the overseer. To deal with them at each second in a day is likewise troublesome. Along these lines, we propose a creative keen patient help and medical services observing framework utilizing sensors that monitors their heartbeat and internal heat level and educates the guardian for any basic circumstances. Likewise, it sends the warnings to the Smartphone of the guardian dependent on their prerequisites and crisis utilizing motions through an accelerometer. A portion of the essential necessities like requirement for food and water need to go for washroom are educated to the overseer through these motions. The sensors are associated with Node MCU gadget controlled by IOT through Wi-Fi. On the off chance that, the individual tumbles down 'from wheel seat, a crisis mail is shipped off the guardian. The excess patients in a ward can't utilize the above module as it is superfluously set off when the patient moves. So we propose a different module here. A 2.4'inch TFT LCD Touchscreen interfaced to an Arduino Mega that can send same messages to the overseer by a simple touch which additionally screens the patient's internal heat level and heart-beat utilizing the necessary sensors and sends messages to the guardian during irregular conditions

Keywords: MCU, IOT, Aurduino, Rasberry-p

1. INTRODUCTION:

In this era of technology, where innovations are made every day to replace or reduce human work, it is important to get solution to the everyday human embedded system

An inserted framework is a PC framework with a committed capacity inside a bigger mechanical or electrical framework, regularly with on going processing imperatives. It is implanted portion of a total gadget frequently including equipment and mechanical parts. Implanted frameworks control numerous gadgets in like manner use today. 98 percent of all chip are produced as parts of implanted frameworks. Instances of properties of normal inserted PCs when contrasted and universally useful partners are low force utilization, little size, rough working reaches, and low per-unit cost. Since the implanted framework is committed to explicit errands, plan specialists can improve it to decrease the size and cost of the item and increment the unwavering quality and execution. Some installed frameworks are mass-created, profiting by economies of scale.

Inserted frameworks range from versatile gadgets, for example, computerized watches and MP3 players, to enormous fixed establishments like traffic signals, processing plant regulators, and generally complex frameworks like half and half vehicles, MRI, and flight. Intricacy fluctuates from low, with a solitary microcontroller chip, to extremely high with various units, peripherals and organizations mounted inside a huge undercarriage or nook. The program directions composed for installed frameworks are alluded to as firmware, and are put away in read-just memory or blaze memory chips.

1.1. Implanted Systems in Health care.

While there were enormous steps in the clinical business as far as creation to anti-toxins and fix to lethal infections, there was still an incredible arrangement that was obscure. Clinical hardware was enormous, bulky and costly. Not all specialists approached these gadgets, and as such clinical determination was moderate coming and lumbering. Specialists depended on the depiction from the patient and their perception of side effects to make an analysis and recommend medication. types of progress in clinical advancement have far outperformed the longings for clinical experts who practiced during the 1950s. Scientists, investigators, and creators have developed tremendous degree clinical machines like ECG, CT scanners, MRI, X-shaft, electronic defibrillators - these machines take pictures of bones, tissue and the structure and improvement of the body's organs. Regardless of the way that these clinical contraptions range in size from a breadbox to a china department, they do contain same embedded systems controls the equipment in your vehicle and your wearable advancement - yes introduced structures. On going advances in embedded structures development are rapidly changing clinical consideration game plans. On account of the progression in embedded advancement and IoT (Internet of Things); we are gone to a destiny of more unassuming, more savvy, wearable and related clinical contraptions.

Embedded structures have been fundamental for the progression of clinical devices and the reason behind the gigantic overhauls in the advancement. These devices are more unassuming and more conservative than any time in ongoing memory. Splendid contraptions like circulatory strain screens and glucose screens are allowing patients to proactively screen their afflictions from wherever. Gone are the events when they were expected to go to the facility or even their home for consistently tests. Furthermore, clinical devices are withering from truck estimated profound machines to lightweight handheld contraptions to inserted devices that are more unobtrusive than a matchbook. The Internet of Things (IoT) is the association of genuine contraptions, vehicles, home devices, and various things introduced with equipment, programming, sensors, actuators, and organization which enables these things to interface and exchange data, making open entryways for more direct blend of the real world into PC based structures, achieving viable improvements. Proposed Methodology:

2. METHOD OF IMPLEMENTATION: MODULE 1

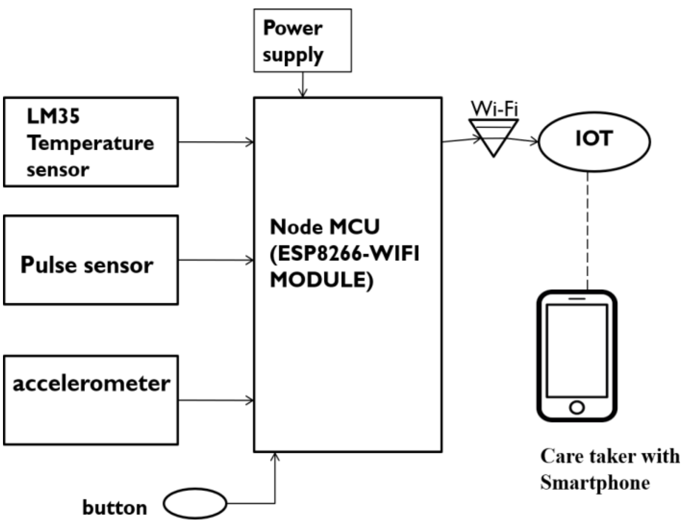


Figure2.1 Block Diagram Module 1

we proposed a system where you can easily convey the messages through the patient's hand movements. To prepare this arrangement, we used a popular open source IOT platform known as NodeMCU. It has only one Analog pin(A0) and 9 Digital pins(D0-D8). It comes with an in-built Wi-Fi module known as ESP-8266. This Wi-Fi platform connects to IOT cloud, which is interfaced you to your mobile phone. Here we used three sensors for the monitoring and assistance of the paralysis patient. From which of those, one component plays a more crucial role as it is used to convey the messages through hand movements. That is the Accelerometer sensor. A button is also interfaced to the NodeMCU kit to perform a task similar to the accelerometer sensor which is not by hand activity but by pressing action. A Pulse sensor is used to detect the patient's pulse count and heartbeat. A Temperature sensor, popularly known as LM35 sensor is used to monitor the patient body temperature. The power supply is given through a 3.3v Regulator via 9v battery.

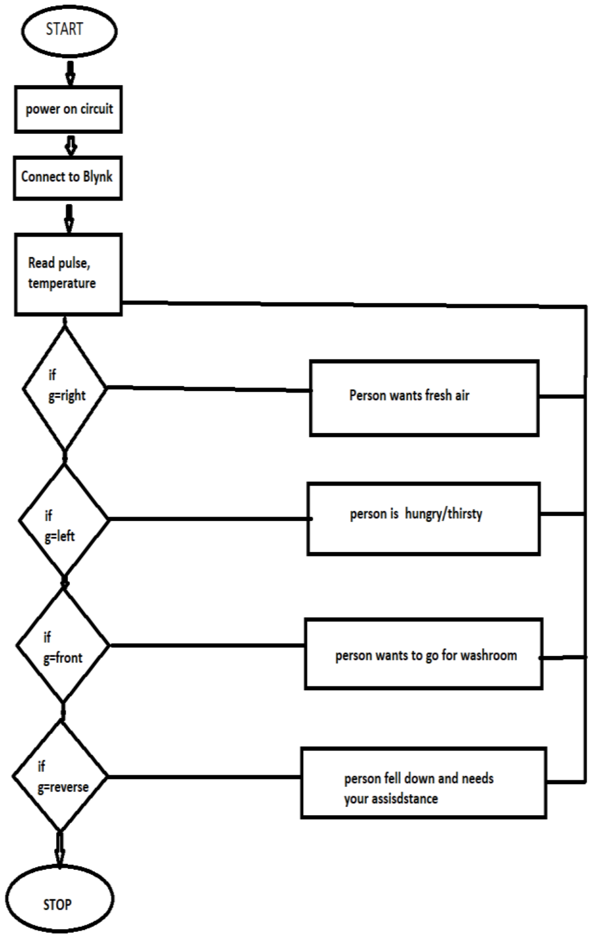
Since we used three sensors which take its input as analog signal, an Analog to Digital channel extender is used to convert the analog input into digital output. One sensor is connected directly to the NodeMCU and the other two are interfaced to the ADC. This Analog to Digital extender is popularly known as MCP3208 ADC. The press button is interfaced to one of the digital pins of the NodeMCU as it takes digital input of 1 and 0. Pressing indicates 1, otherwise 0. The main reason of a simple press button is to use it for the frequent need of the patient as it can indicate a message by simple pressing action instead of hand gesture. It is located on the index finger which can be manipulated using your thumb which makes it easier to handle.

Temperature sensor detects the body temperature of the patient and when it raises above or below the normal value of (98 – 101) °F, the module sends a message through the IOT platform to your smart phone. Similar is the case with the Pulse sensor. When the pulse count increases above or below the normal value of (60 – 100) BPM, the kit sends a signal to your smart phone through IOT cloud. Accelerometer, also known as a position sensor senses the position of the hand using the co-ordinates of X, Y and Z axis. The normal constant position of the patient's hand is given as default position and

no message is sent by this gesture. Messages are sent when the hand position is at either 0 or 180 degrees of X, Y and Z axis.

Also, if the person/patient falls down from the wheelchair or bed, by the sudden abrupt change in position or axis, a message is immediately delivered to the email and mobile phone of the caretaker so he can attend him/her without any blunder.

2.1 FLOW DIAGRAM



2.2 Flow Diagram Module 1

2.2 BLOCK DIAGRAM: MODULE 2

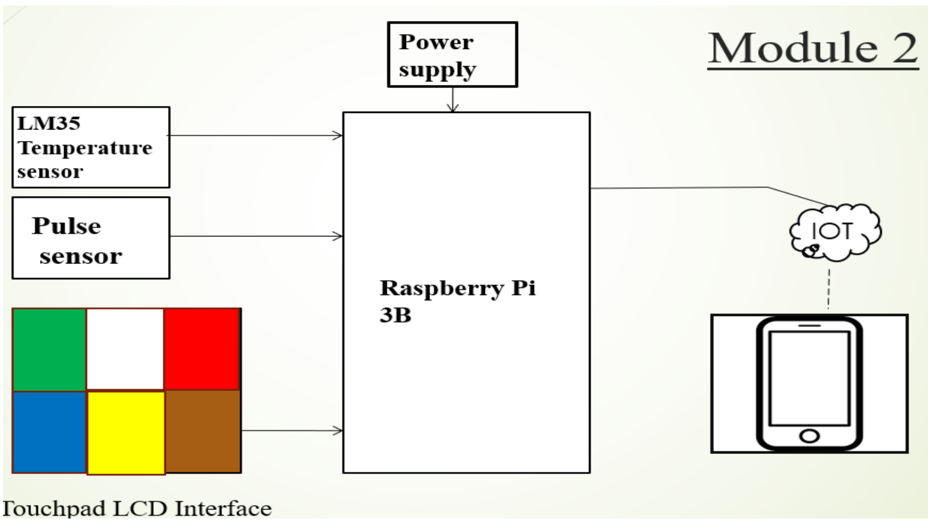


Figure 2.3 Block Diagram Module 2

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2.3 BLOCK DIAGRAM DESCRIPTION : MODULE 2

The patient assistance module has two main important components: Raspberry Pi module and 3.5’TFT LCD Touch-screen. Along with this, there are two more sensors interfaced to the TFT-MEGA interface. They are LM35 Temperature sensor and Pulse sensor. This supply is used to power all the sensors along with the parent module along with the Raspberry Pi and LCD display. Through a mere touch on TFT, Messages are sent to the care taker through the IOT cloud to your smart phone in the form of e-mail and notifications.

2.4 METHOD OF IMPLEMENTATION: MODULE 2

In this project, we proposed a system where you can easily convey the messages through a mere simple touch on the TFT by the patient. To prepare this arrangement, we need an Raspberry Pi which is interfaced to a TFT LCD Touch-screen interface. Here we used two sensors for the monitoring and assistance of the patient. A Pulse sensor is used to detect the patient’s pulse count and heartbeat. A Temperature sensor, popularly known as LM35 sensor is used to monitor the patient body temperature.

This module is specifically designed for the patients who can move a little muscle so as to avoid the unwanted triggering which generally occurs if we use the MODULE1

When the patient wants some assistance, he simply touches the required message displayed on the TFT and the message is delivered to the caretaker through IOT. This adds more customized assistance as such providing drop down menu for the food and water.

Food menu includes:

1.Rice
2.Fruits
3.read
4.Idly

Water menu includes:

1.Water of 250ml
2Water of 500 ml
3.juice
4.Coconut water

2.8 FLOW DIAGRAM:

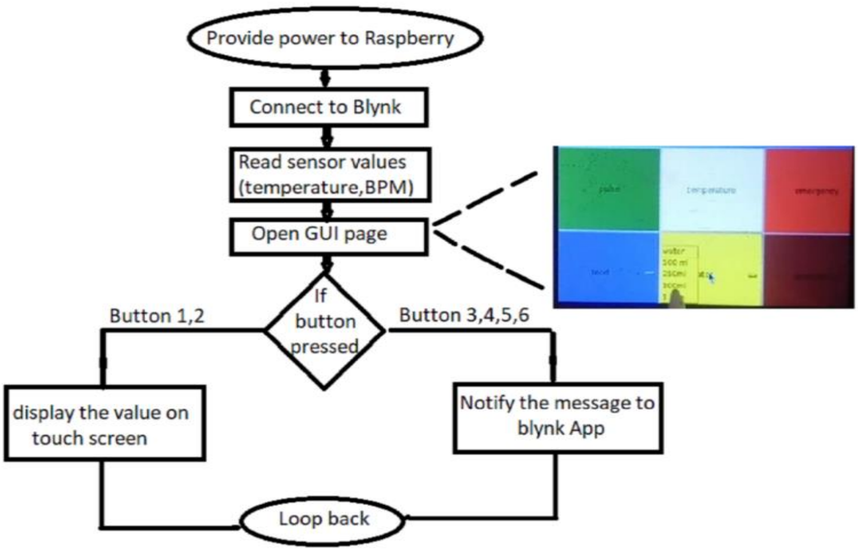


Figure 2.4 Flow chart

- These modules stated above basically provides two functions together to the patient which are:
- Assistance
- Health monitoring

o The test procedure for module 1 is as follows:

- power on the NodeMCU.
- As soon as the NodeMCU starts, it gets connected to Blynk.
- Now a connection has been established between the patient and the care taker.
- For assistance, we could use gestures to notify the care taker . The following are the messages for various gestures:
- Right: Person needs assistance to go out for fresh air
- Left: Person is feeling hungry/thirsty
- Front: Person needs assistance to go for washroom
- Reverse: Person has accidentally fell down and needs your assistance.
- 5.Along with it constantly monitors pulse and temperatures of the patient and displays it on the Blynk.

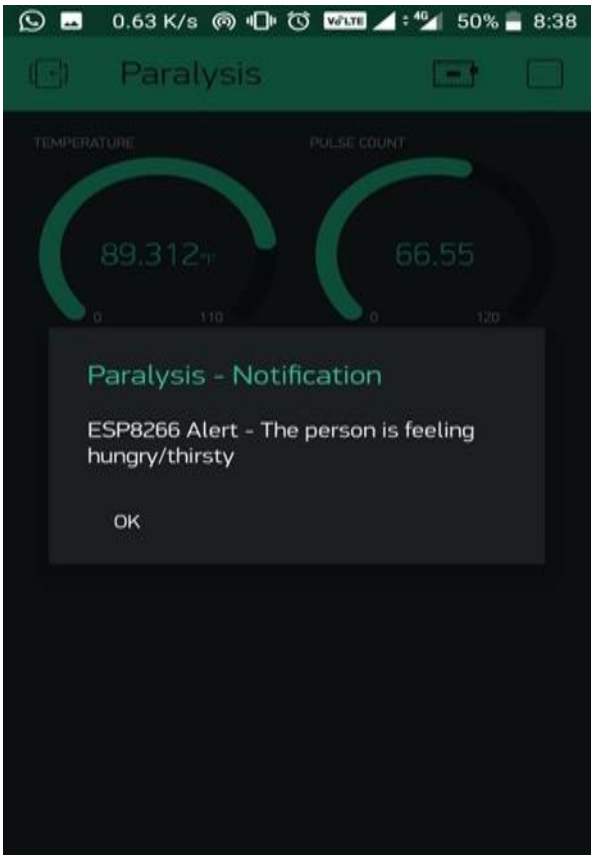
o The test procedure for module 2 is as follows:

- power on the Raspberry Pi.
- As soon as the Raspberry Pi starts, Display loads the start page of the raspberry Pi
- Run the program placed on the desktop.
- The GUI pages will be loaded with 6 grids.
- Following are the functions they contains:
- 1.Pulse reading
- 2.Temperature
- 3.Emergency
- 4.Food
- 5.Water
- 6..Assistance
- The pushbuttons 1 and 2 display the values of pulse and temperature to the patient.
- Pushbuttons 3,4,5 and 6 notifies the caretaker of the assistance patient needs.

RESULTS : MODULE 1

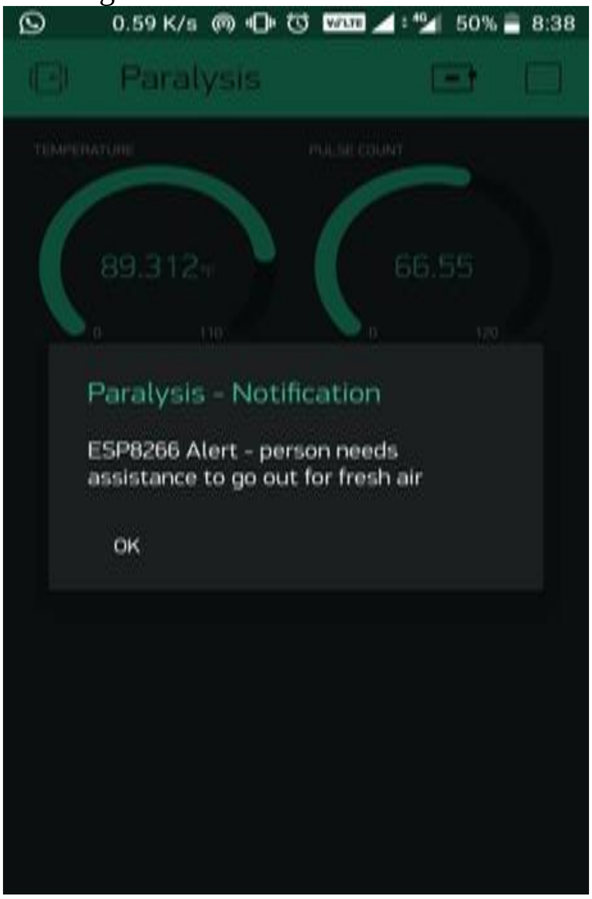
Based on the idea we proposed and the set of sensors and hardware modules we had with us, we systematically established our goal to provide this innovative patient assistance gloves. The code we implemented for this module had been accomplished and verified by programming and testing each of the sensors and then combining all the sub programs to make a complete solution for programming this module.Now the complete working can be explained and understood by the use of pictures shown below:

Body temperature is measured by attaching LM35 to your arm wrist. Pulse count in measured by attaching the sensor to your little finger.

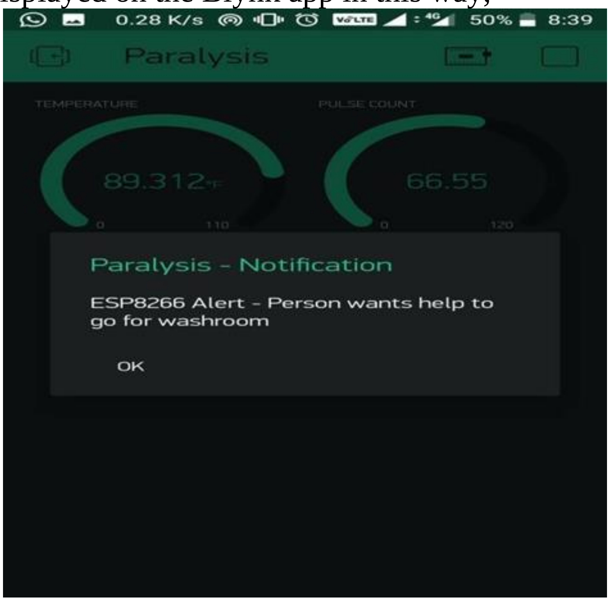


1. Normal hand gesture of the patient so that no message is transmitted.

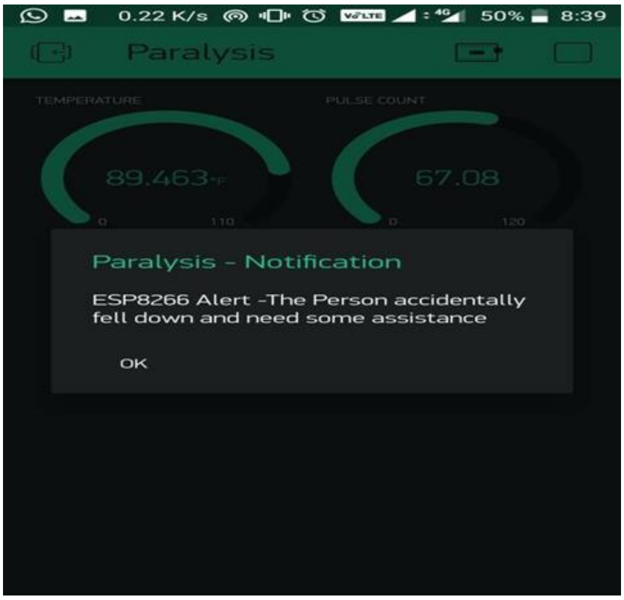
2. When you tilt your hand by 90 degrees right.
Then the message displayed on the Blynk app is as follows,
3. When you tilt your hand by 90 degrees left.
Then the message is displayed on the Blynk app in this way,
When you tilt your hand 90 degrees front.



Then the message is displayed on the Blynk app in this way,



4. When the patient falls down, then the hand is tilted up-side down in this way,



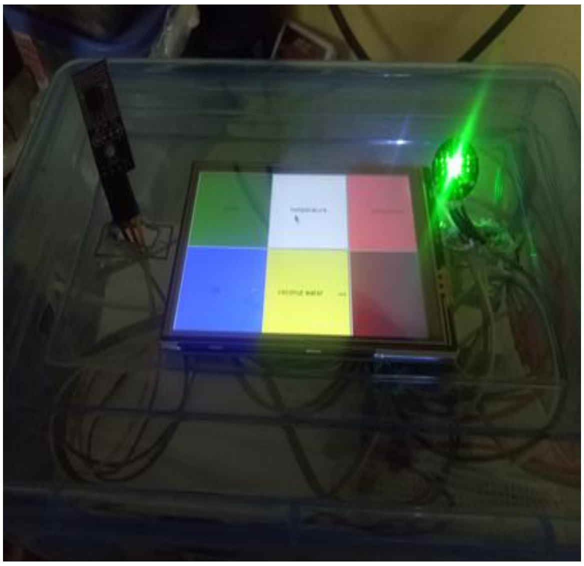
Then the message displayed on the Blynk app is as follows,

3. RESULTS :

Based on the idea we proposed and the set of sensors and hardware modules we had with us, we systematically established our goal to provide this innovative patient assistance gloves. The code we implemented for this module had been accomplished and verified by programming and testing each of the sensors and then combining all the sub programs to make a complete solution for programming this module.

Now the complete working can be explained and understood by the use of pictures shown below:

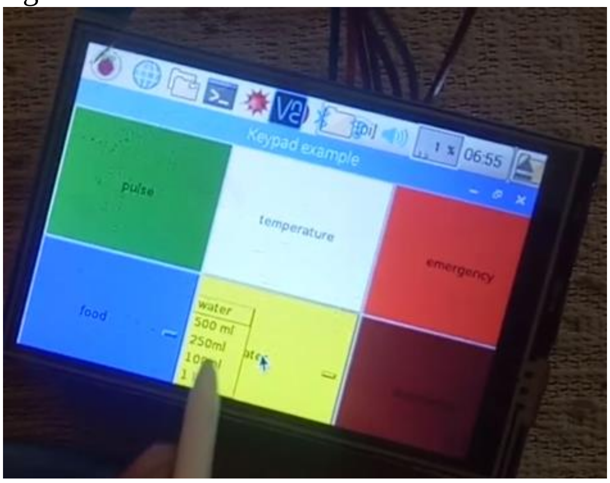
1. The kit with touch screen and sensors on the top would look like this:



2. The GUI page will look like this:

3. The food combo has the following menu for which different notifications are assigned.

4. The water combo has the following menu for which different notifications are assigned



4. CONCLUSION

Ongoing advances in miniature electro-mechanical frameworks (MEMS) innovation, remote interchanges, and computerized hardware have empowered the improvement of minimal effort, low-power, multifunctional remote sensor hubs that are little in measure and impart untethered in short separations. These little remote sensor hubs, which comprise of detecting, information handling, and conveying segments, influence the possibility of sensor networks dependent on the shared exertion of an enormous number of hubs. The productivity of clinic staff is expanded by utilizing a portion of these recently accessible applications and apparatuses. In the medical care field, issues, for example, long haul patientcare in clinics, uphold for old individuals at home and in a walking climate are being talked about in the domain of remote sensor networks.This paper has introduced a distant patient checking framework design utilizing remote sensor hubs fit for observing a few unique conditions: clinics, home and mobile. Likewise observing older patients in a home climate, and patients influenced by COPD and PD in mobile conditions. The framework actualized is a constant patient observing framework, which empowers clinical specialists to watch their patients on a far off site, to screen their indispensable signs and to offer them some guidance for medical aid therapies.

5. REFERENCES

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