AUTOMATED PARALYSIS PATIENT CARE SYSTEM

Submitted in partial fulfillment of the requirements for Of Bachelor of Technology degree in **Biomedical Engineering**

By

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(DEEMED TO BE UNIVERSITY)

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BONAFIDE CERTIFICATE

This is to certify that this Interdisciplinary Project Report is the bonafide work of **Aakesh U (39240001), Yaswant Rajasekaran (39240041)** who carried out the project entitled **"AUTOMATED PARALYSIS PATIENT CARE SYSTEM"** Under our supervision from Jan to April 2022.

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Internal Examiner **External examiner**

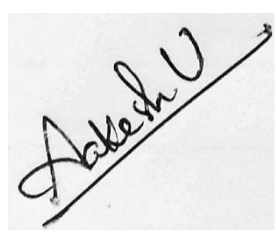
DECLARATION

We, **Aakesh U (39240001), Yaswant Rajasekaran (39240041)** hereby declare that the Interdisciplinary Project Report entitled **“AUTOMATED PARALYSIS PATIENT CARE SYSTEM”** done by us under the guidance of **Dr. Bethanney Janney, Department of Biomedical Engineering** is submitted in partial fulfillment of the requirements for the award of **Bachelor of Technology** degree in **Biomedical Engineering.**

DATE: 28/04/2022

PLACE: Chennai

SIGNATURE OF THE CANDIDATE



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ABSTRACT

Most paralytic people are unable to communicate their needs because they are unable to speak properly or communicate through sign language due to a loss of motor control in their brain. In this case, our proposed system assists the disabled person in displaying a message on the LCD with a simple hand motion. The proposed system works by detecting various hand tilt directions. The user simply needs to tilt the device in different directions to convey different messages. The statistics of motion are measured using an accelerometer. It then sends this information to the microcontroller, which processes it and displays the appropriate message based on the input. A buzzer will start buzzing and a message will be generated when it gets a motion signal from the accelerometer. When the IFTTT app is triggered when the call attendant message is created when the patient tilts his/her hand downwards, a message is sent to the doctor's phone to go and treat the patient right away. Patients who are paralyzed can use this system to communicate their most basic needs to others.

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LIST OF ABBREVIATIONS

ABBREVIATIONS	EXPANSION
GBD	Global Burden of Diseases
NGO	Non-governmental organizations
LCD	Light Emitting Diode
SMS	Short Message Service
RF	Radio Frequency
LCD	Light Emitting Diode
SOC	System on Chip
DSP	Digital Signal Processing
FLIX	Flexible Length Instruction Extensions
DMP	Digital Motion Processor
MEMS	Micro Electro Mechanical System
IR	Infra-Red
UV	Ultra Violet
AC	Alternative Current
DC	Direct current

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CHAPTER-1

INTRODUCTION

According to the Global Burden of Diseases (GBD), stroke claims the lives of around 5.8 million people each year. Stroke is the most common cause of paralysis, affecting around 33.7 percent of the population. Paralysis can also arise as a result of severe spinal cord injury sustained as a result of a serious accident. The World Health Organization recently conducted a survey. Of 5.6 million people who were predicted to be paralyzed, accounting for 1.9 percent of the population among the fifty. However, there is no ideal tracking system in place to keep track of the patient's health and daily demands. In today's fast-paced world, it's impossible to continually look after loved ones who require assistance. To address these issues, a device is presented that uses the ESP32 and the accelerometer to detect the motion of the patient's hand, allowing them to convey their most basic requirements to their caregivers. We come across hospitals and non-governmental organizations (NGOs) that serve paralytic individuals who have had their entire or partial body paralyzed by the paralysis attack. Most of the time, these persons are unable to communicate their requirements since they are unable to speak properly or communicate through sign language owing to a lack of motor control in their brain. In this case, we present a system that allows a disabled person to display a message on an LCD screen by simply moving any portion of his body with motion capabilities. This system also handles situations where no one is available to assist the patient, by sending a message via ESP32 of what he wishes to say via SMS. To send a message, the user now only needs to tilt His hand at a specific angle. Different messages are conveyed by tilting the gadget in different directions. We're going to use an accelerometer to measure motion statistics. The ESP32 analyses the data and displays the appropriate message based on the input received from various sensors. The associated message is now shown on the LCD screen. When it receives a motion signal from the accelerometer, it also sounds a buzzer and displays a message. In this approach, the Automated Paralysis Patient Care System truly automates the patient's ability to care for themselves, ensuring timely attention and, as a result, optimal health.

CHAPTER-2

LITERATURE SURVEY

Kinjal Raykarmakar, et al. (2022) This device was created using microcontroller-based circuitry. It makes use of a receiver and transmitter circuit as well as a hand motion recognition circuit. The accelerometer and gyroscope are utilized in the hand motion circuit to detect hand movements, which are subsequently wirelessly transmitted to the receiver system through radio frequency (RF). The receiver system is designed to accept and interpret these commands and show them on the LCD and transfer the data online to a Gecko Server for the Internet of Things (IoT). The IoT Gecko Server subsequently presents this information online to obtain the desired result. This device was created using microcontroller-based circuitry. It makes use of a receiver and transmitter circuit as well as a hand motion recognition circuit. The accelerometer and gyroscope are utilized in the hand motion circuit to detect hand movements, which are subsequently wirelessly transmitted to the receiver system through radio frequency (RF). The receiver system is designed to accept and interpret these commands and show them on the LCD and transfer the data online to a Gecko Server for the Internet of Things (IoT). The IoT Gecko Server subsequently presents this information online to obtain the desired result.

Hira Beenish, et al (2021) The suggested and implemented system of this device is designed to facilitate communication between the paralyzed patient and the caregiver by allowing the paralyzed patient to communicate their needs by message using hand, finger, and foot movement. The gyro MPU6050 is connected to Arduino UNO, which is mounted on the gloves, to detect movement. Flex sensors are utilized to monitor finger movement, while gyro sensors are put on the patient's hand to detect any changes in the patient's hand. The system is tethered to three major tasks. These are to send messages to communicate and understand the demands of the patient through the hand, finger, and foot movements. After any of these movements, i.e. hand, finger, and foot, the system will alert the caretaker to the patient's needs. Because they are unable to voice their issues and needs correctly, paralyzed patients have difficulty communicating with caregivers to meet their needs. They have created a paralysis patient healthcare system integrating IoT and GSM to tackle this challenge faced by the paralyzed patient. In this system, the paralyzed patient sends signals to the caregiver using gyro gloves. The GSM module activates when the patient tilts their hand, fingers, or feet, sending a message to the pre-programmed caretaker's contact numbers.

A.F. Kadmin et, al. (2018) Using the gesture sensor on the (APDS-9960), the patient will be able to communicate whatever they wish via the GSM module by sending a message. This sensor's function is that it allows the patient to send a message by just swiping their hand across the gesture sensor. Aside from that, the data will be shown on an LCD screen at the convey sign, making it easier for the patient to understand what they wish to communicate. Aside from that, if the patient swipes their palm to the emergency case, the buzzer will sound. The primary idea behind the project is that the hand gestures work as a transmit signal, while the gesture sensor receives the signal and sends data to the Arduino board. This concept will aid paralyzed patients in communicating their needs or instructions. Finally, the project was designed to establish a system with an ARDUINO as the primary controller. This project was built by current technologies to ensure that paralyzed patients receive the finest treatment and care while in the hospital, without the need for family members to assist them. All they have to do is give a simple movement gesture to the sensor.

Mohan raj. P et, al. (2018) Heart rate, respiration rate, and temperature are among the metrics included in this module. The main purpose of this system is to monitor the paralyzed person's heart rate, breathing rate, and temperature, with the data acquired by the sensors being relayed to the msp430 Launchpad. This Launchpad will use code composer studio complier to process the sensed data using an embedded program for the appropriate parameters. At the operational level, the program is open for monitoring. A paralyzed person's normal heart rate is around 60-100 beats per minute. When the range falls below 60, it causes heart block and syncope, but when it rises above 100, it causes anxiety and tachycardia. Numerous issues paralyzed people face, including paralysis in their limbs, hand, voice tract, and other body parts.There are procedures in place for their unique comforts. However, this method will aid in the monitoring of all causes that cause paralysis and informing the caregivers so that therapy may be administered before the paralysis progresses.

Ms.N.Renee Segrid Reddiyar P et, al. (2021) Connect the sensors to a node MCU, which is then connected to a webpage, such as adafruit io. We can monitor the data collected by the sensors using this web page. Adafruit IO is an IoT platform for data storage, data visualization, and device control that is straightforward to use. This project was made possible by the Adafruit website. On the mobile, the output is presented. Connect the sensor that will be attached to the buzzer. A sound will be produced and the output will be presented based on the patient's needs and the position of the accelerometer. If the patient's pulse or temperature rises over normal, it will be shown on the webpage, which will be continuously monitored. According to the change in the position of the accelerometer in the final circuit On the LCD panel, a message will be displayed. If the patient does not move, the word 'Nothing' will be displayed. When the accelerometer reaches a specific angle, it indicates that they require food, and an alarm will sound. They require water, and if the angle changes to meet their needs, the caregiver will be notified. If they need to use the restroom, they can tilt their hand in a specific position, which will be displayed on the LCD screen. Pulse rate and body temperature, as well as fear, will be recorded so that if the patient is in an emergency or falls on the floor, the information will be shown automatically and a continuous warning sound will be made through the buzzer. AdaFruit will keep track of the patient's health and save their records at all times. The heart rate, temperature, and humidity will be shown on a mobile device utilizing the Adafruit webpage in this project.

Vidya Sarode et, al. (2021) Angle sensors transform a physical characteristic into an electrical signal that may be interpreted by a human or an instrument. As a result, the barrier that paralytic persons encounter in communicating with society can be greatly lowered with the use of this method. Stress, high blood pressure, and a malfunctioning central nervous system are all factors that contribute to paralytic attacks. Patients who have had a paralytic attack have their bodies completely or partially paralyzed. This paralyzed patient is unable to communicate their needs or desires. Because these patients lack a rapid reflex system, there is no or limited synchronization between the vocal systems, limbs, and brain in these patients. This proposed initiative may be able to help in such a case. Computer processing speeds have increased tremendously, and computers have progressed to the point that they can aid people in performing complex jobs. It is argued that applying these new approaches to decode sign language aids in obtaining more efficiency in the field of gesture recognition, making it easier to grasp for everyone.

Diptee Gaikar et, al. (2020) The project utilized telecommunication technology, with the evolution in telecommunication being applied in this project through the usage of the GSM module. Simultaneously, a few circuits and software are utilized to control all of the main and sub equipment. A microcontroller and a GSM module are among the components used. The gesture sensor will assist the patient in communicating whatever they desire via the GSM module by sending a message. The patient simply needs to move the body part to which the sensor is attached to send a message using this sensor. Aside from that, the data will be presented on the LED screen so that the patient may see what he or she wants to say. When there is an emergency, on the other hand, the buzzer will sound and an SMS alert will be issued to the patient's caregiver. This project's major goal is to assist disabled patients in communicating their messages. Although there are various systems in place to monitor the health of paralyzed patients, there are few that focus on communication. However, this technology uses communication to bridge the gap between the patient and others, allowing the paralyzed patient to relieve stress by disclosing their thoughts and motivating them as much as possible. Furthermore, this technology is both affordable and practical.

Dr. M. Mohana et, al. (2020) The accelerometers are attached to the gloves in such a way that each one corresponds to one of the fingers. These accelerometers are connected to the Arduino UNO, which is an Atmega 32B, using connecting cables. Then the accelerometer's steady value changes and the system identifies the change and displays the related messages using the mapping technique. The beep sound activates the system, causing it to sound an alarm when the message is shown, alerting the patient's attendants. The system in this device is meant to be more efficient than the present system since it employs the KNN algorithm, which is significantly more efficient and delivers superior accuracy and correctness, allowing for better message mapping. The patient's hand is fitted with the gadget. The patient is initially taught to recognize the message that will be displayed as he or she folds each finger. As a result, when the patient requires assistance, he only needs to bend a finger or a combination of fingers. The orientation of the accelerometer sensor changes as the patient bends a finger, resulting in a voltage change. The obtained value is used as the device's input. For each range of values provided by the sensors, a predefined message such as "call the doctor," "pain," "require food," "medication," and so on is stored and then displayed. When a message is shown, the attendant is notified by a beep sound. As a result, it encourages the patient to express his basic wants.

Vacancy. V et, al. (2020) When the Equipment is turned on, the SEN 11574 pulse rate sensor periodically detects the patient's heart rate and sends it to the Patient's application. The values are updated in Google's Firebase, which is a Real-Time Database. The values are retrieved from the Firebase by the CareTaker's mobile application, which also provides alert messages and voice notifications. The system incorporates a patient and caregiver mobile application. This system also contains hand movement detection (using MPU6050) to alert the caregiver to the patient's present needs, and the patient can even meet his wants. Only four-hand motions are employed in this system. When the equipment is turned on, the patient's heart rate is supplied to the Patient's application regularly. Whenever the patient's BPM rate exceeds 90 or falls below 60, an urgent notification is sent via the Care application to the Care-Taker. Taker's If the Care-phone Taker is connected to the house's Bluetooth speaker, anyone in the house will be aware of the patient's needs, allowing anyone to meet the patient's demands. In this approach, four hand signals are utilized to communicate the Patient's needs to the Care-Taker.

Rohit Malgaonka et, al. (2019) The related message is shown on the LCD screen by this microcontroller. When it receives a motion signal from the accent, it also emits a sound and sends a message. If no one is available to respond to the message on the LCD screen, the patient can choose to slant the device for a longer period, which will cause an SMS to be sent over a GSM modem. The patient's registered caretaker with the message the patient wishes to send. In this approach, the Automated Paralysis Patient Care System truly automates the patient's caretaking abilities, ensuring prompt attention to the patient and, as a result, the patient's excellent health. This technology does so simply, and if the bodily parameters suddenly deviate from their ideal ranges and into the danger zone, an SMS is sent to the patient's family or doctor for rapid critical care, completing the care unit for the paralyzed patient. This gadget has made message thesaurus feasible just through the movement of a bodily portion. This system's key benefit is the convenience with which messages may be sent, as well as the ability to set a specific time for a medicine alarm. This approach can be used to create a simple gadget for paralyzing people without the need for sophisticated inputs. The prototype we created is functional, although it is limited to a tiny operating area.

CHAPTER-3

AIM AND SCOPE

3.1 AIM

- There are various medications and physiotherapy available for paralyzed individuals, but there is no specific system in place to meet their needs.
- To address these issues, a system has been implemented to communicate their basic needs just by the movement of their hand.
- This method aids paralyzed persons in meeting their most basic needs by communicating their needs to their caretakers.
- This is something that can be done using some sensors and ESP32.

3.2 SCOPE

- More sensors such as pressure sensors, pulse sensors, contact sensors, and flexion sensors can be introduced for more accurate and precise data collection. Also, flexion sensors in gloves can be used to decode sign languages created by the hands.
- The project can be further developed into an automatic wheelchair wherein the wheelchair will be moved just by hand gesture. Along with only message transmission, other data such as body temperature, pulse rate, etc. can be transmitted to a nurse and maintained in a real-time record for the patient.
- A graphical LCD can be used to display a graph of the rate of change in health

parameters over time. the whole patient's healthcare monitoring system which we have framed can be integrated into a small compact unit as small as a cell phone or a wrist or smartwatch.

- This device is easy to handle for the patient or other persons. In the future, an Artificial Intelligence-based patient idleness monitoring module along with a self-speech training module can be introduced in the patient's application to keep the patient aware of himself. Also, the patient can be directly linked with their doctor to track the activities of the patient to provide even more personal care depending on the wants and the status of the patient's health.

CHAPTER-4

MATERIALS AND METHODS

4.1 METHODOLOGY

- This circuit was created with the help of microcontroller-based circuitry. An accelerometer detects the angle of hand movement in a specific direction in this gadget, and this information is subsequently communicated to the microcontroller.

- The microcontroller then analyses this data to determine the angle and direction of the hand movement. After that has been determined, the microcontroller generates a specific message that has previously been pre-programmed if the hand is slanted at a specific angle and in a specific direction.

- So, if the paralyzed patient tilts their hand in the direction of the +x-axis, -x-axis, +y-axis, or -y-axis, the microcontroller will generate a specific message forthat direction, which it will then send to the LCD panel (16X2) to be shown on it.

- When the microcontroller generates a message when the paralyzed patient wants to transmit a message by tilting his or her hand at a specific angle and in a specific direction, the attendee or doctor will be alerted by an audible alarm created by a buzzer.

- An LED is also used to provide a visual alarm for the same purpose.
- If the gadget generates a "Call attendant" message based on the patient's hand position, a message is sent to the doctor's mobile phone through IFTTT app, instructing him to promptly attend to the patient.
- The esp32 receives its power from batteries

4.1.1 BLOCK DIAGRAM WITH EXPLANATION

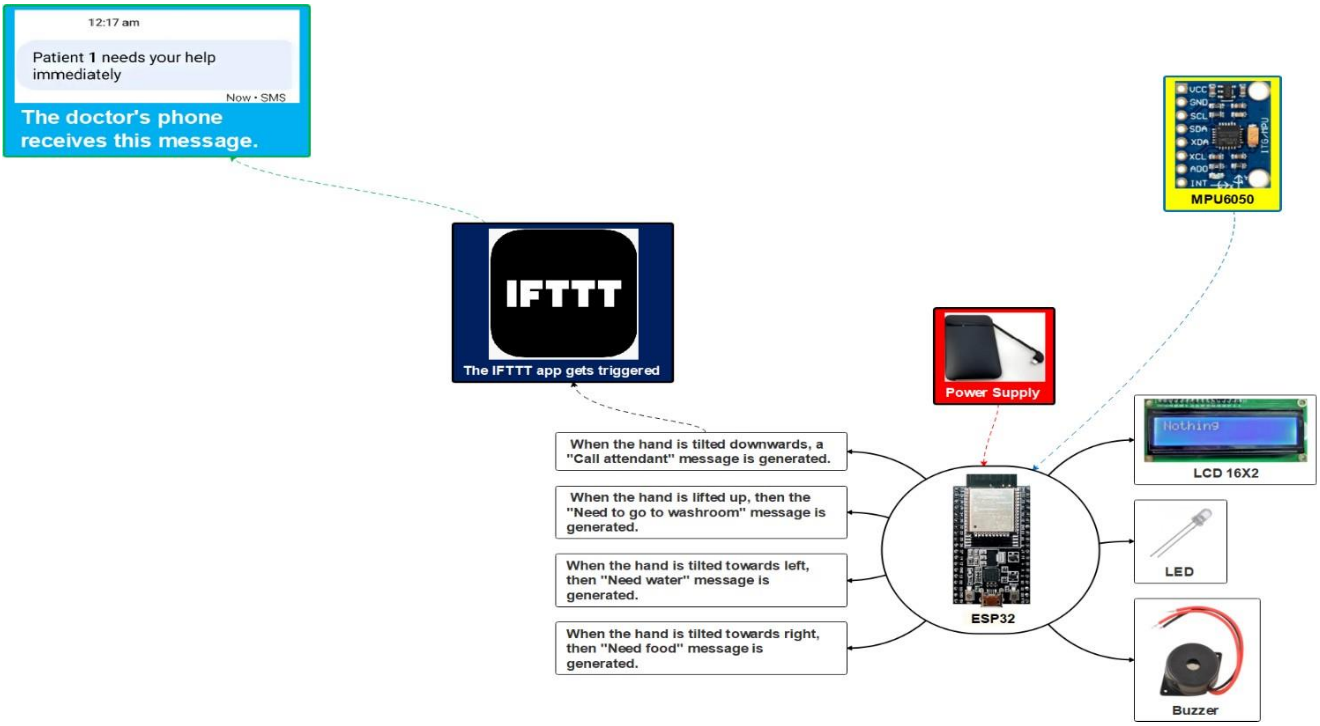

Fig 4.1.1: BLOCK DIAGRAM

The ESP32 microcontroller is illustrated in this block diagram receiving a 3.3V power supply from a power source. The Esp32 is then connected to the MPU6050, which delivers data about the patient's hand movement to the ESP32, which generates a customized message based on the patient's hand movement's specific direction and set angle. Every message generated by the ESP32 is shown on an LCD (16X2) screen attached to the ESP32. When the Call Attendant message is generated, the IFTTT app sends a message to the doctor's phone, instructing him to go aid the patient immediately. When the ESP32 sends a message, the LED linked to it will light up, indicating that a message has been sent. A buzzer will also beep whenever the ESP32 generates a message, providing an auditory alarm. As a result, this technology assists paralyzed patients in meeting their most fundamental demands at the appropriate time, allowing them to overcome their challenges.

4.2 HARDWARE USED

4.2.1 ESP32:

ESP32 is a low-cost System on Chip (SoC) Microcontroller from Espressif Systems, the developers of the famous ESP8266 SoC. It is a successor to ESP8266 SoC and comes in both single-core and dual-core variations of the Tensilica's 32-bit Xtensa LX6 Microprocessor with integrated Wi-Fi and Bluetooth.

Specifications of ESP32:

- Single or Dual-Core 32-bit LX6 Microprocessor with clock frequency up to 240Hz.
- 520KB of SRAM, 448 KB of ROM, and 16 KB of RTC SRAM.
- Supports 802.11 b/g/h Wi-Fi connectivity with speeds up to 150 Mbps.
- Support for both classic Bluetooth v4.2 and BLE specifications.
- 34 Programmable GPIOs.
- Up to 18 channels of 12-bit SAR ADC and 2 channels of 8-bit DAC.
- Serial Connectivity includes 4 X SPI, 2 X I2C, 2 X I2 S, 3 X UART.
- Ethernet MAC for physical LAN Communication (requires external PHY).
- 1 Host controller for SD/SDIO/MMC and 1 Slave controller for SDIO/SPI.
- Motor PWM and up to 16-channels of LED PWM.
- Secure Boot and Flash Encryption.
- Cryptographic Hardware Acceleration for AES, Hash (SHA-2), RSA, ECC, and RNG.

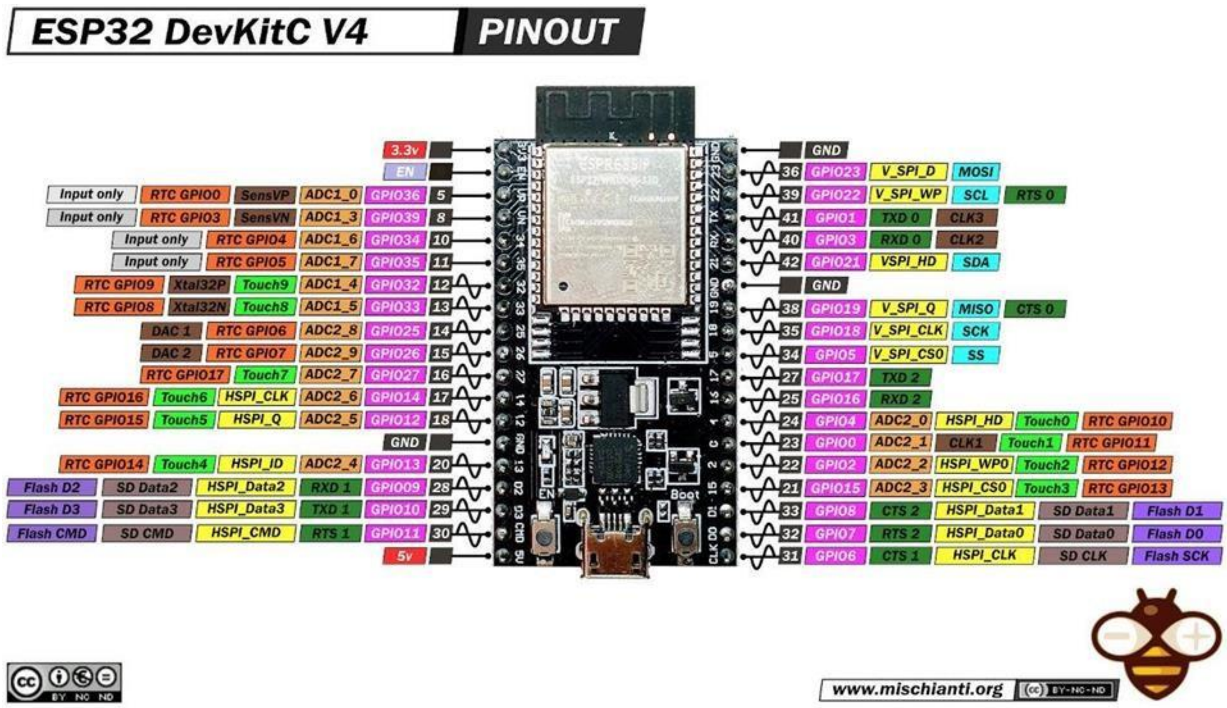

Fig 4.2.1: ESP32

4.2.2 Microcontroller module:

Cadence provides system-on-chip (SoC) designers with the world's first and only configurable and extensible processor cores fully supported by automatic hardware and software generation. Cadence® Tensilica® Xtensa® processors, such as the Xtensa LX6 data plane processing units (DPUs), enable SoC designers to add flexibility and longevity to their designs through software programmability as well as differentiation through processor implementations tailored for the specific application.

Features:

- The microcontroller module has a 32-bit base architecture that is very efficient, compact, and low-power.
- It can be configured using a variety of pre-verified options, including ten different digital signal processing (DSP) options. It adds application-specific instructions, execution units, register files, and I/Os that are designer-defined.
- With many, broad, designer-defined FIFO, GPIO, and lookup interfaces, it has

virtually limitless I/O bandwidth. It offers a 5- or 7-stage core instruction set architecture (ISA) pipeline depth option, as well as extended DSP pipelines up to 11 stages.

- It includes customizable local memories up to 8MB with the option of memory parity or ECC. It has flexible-length instruction extensions (FLIX) instructions with a width of up to 128 bits.

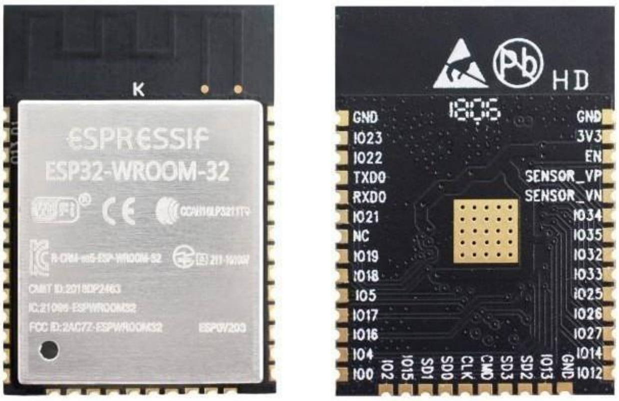

Fig 4.2.2 Microcontroller module:

4.2.3 MPU6050:

A three-axis accelerometer and a three-axis gyroscope are part of the MPU6050 Micro Electromechanical System (MEMS). It may be used to quantify velocity, direction, acceleration, displacement, and other motion-like qualities. The Digital Motion Processor (DMP) of the MPU6050 is capable of executing complex calculations. A 16-bit analog to digital converter is included in the MPU6050. It can catch three-dimensional motion at the same time because of this capability. This module offers several well-known and generally accessible functionalities; as a result, it may be used with a well-known microcontroller such as Arduino. The MPU6050 is a perfect alternative if you're looking for a sensor to regulate the motions of your drone, self-balancing robot, RC vehicle, or something similar. For connection with Arduino, this module employs the I2C module. The MPU6050 is less costly and has the advantage of being easy to integrate with an accelerometer and gyro.

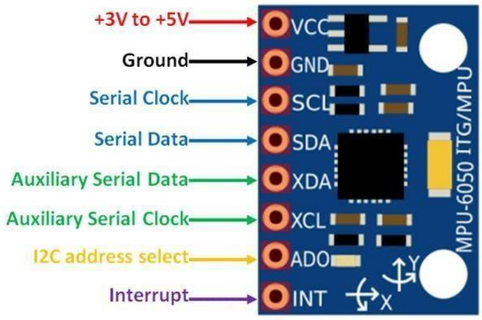

Fig 4.2.3: MPU6050

4.2.4 LCD 16X2:

A liquid crystal display (LCD) screen is a form of electronic display that may be utilized in a range of applications. A 16x2 LCD is a basic module that may be found in a wide range of devices and circuits. On each of its two lines, a 16x2 LCD can display 16 characters per line. On this LCD, each character is represented by a 5x7 pixel matrix. The 16 x 2 intelligent alphanumeric dot matrix display can display 224 unique letters and symbols. The two registers on this LCD are Command and Data. The command register stores various commands sent to the display. The data register stores the data that will be shown. LCDs are turned on (positive) or off (negative) depending on the polarizer configuration (negative). A character positive LCD with a backlight, for example, will have black writing on a backlight-colored backdrop, but a character negative LCD will have a black background with backlight-colored letters. To distinguish between white and blue LCDs, optical filters are utilized. A liquid crystal molecule seeks to untwist when an electrical current is introduced to it. The angle of light traveling through the polarized glass molecule, as well as the angle of the top polarizing filter, as well as the angle of the top polarizing filter, are both changed as a result of this. As a result, light may flow through the polarized glass and into a particular LCD area. As a result, that particular location will darken more than others. Light-blocking is how the LCD works. A mirrored mirror is installed on the back while the LCDs are being manufactured. A polarized glass with a polarizing film is put at the device's bottom, and an indium-tin-oxide electrode plane is preserved on top. With liquid crystal matter above it, a common electrode must wrap the whole LCD area.

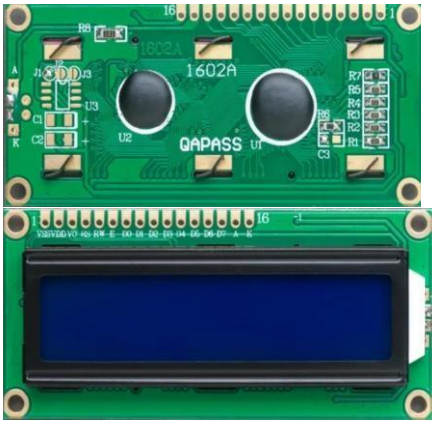

Fig 4.2.6 LCD 16X2

4.2.5 Buzzer:

A Piezo Electric Buzzer Alarm that may be utilized for several applications It operates from 3 to 12 volts. It comes with two mounting holes and is simple to attach to a flat surface. The buzzer is black. The buzzer is approximately 30 mm in diameter. The buzzer is around 10mm tall. The buzzer features two 35mm mounting holes. The buzzer is made of piezoelectric materials. The sound pressure level of the buzzer is 95 dB. Its rated voltage is 12 volts of direct current. The working voltage of the buzzer is between 3 and 24 V. The buzzer can handle up to 20 milliamps of current.

Fig 4.2.7 Buzzer

4.2.6 LED

When electricity travels through a light-emitting diode (LED), it produces light. Photons are produced when electrons in a semiconductor recombine with electron holes, releasing energy. The energy required for electrons to pass the semiconductor's bandgap determines the hue of light (equivalent to photon energy). Multiple semiconductors or a light-emitting phosphor layer on the semiconductor device are used to generate white light. LEDs originally debuted as working electrical components in 1962, emitting low-intensity infrared (IR) light. Infrared LEDs are employed in remote-control circuits, which are used in a broad variety of consumer electronics. The first visible-light LEDs were low-intensity and only came in red. Early LEDs were extensively used as indicator lamps and in seven-segment displays, where they replaced small incandescent bulbs. LEDs in visible, ultraviolet (UV), and infrared wavelengths have lately been produced with high, low, or intermediate light output, such as white LEDs excellent for room and outdoor area illumination. LEDs have also given rise to new types of displays and sensors, and their fast switching rates are useful in advanced communications technology, with applications ranging from aviation lighting to fairy lights, automotive headlamps, advertising, general lighting, traffic signals, camera flashes, lighted wallpaper, horticultural grow lights, and medical devices. LEDs outperform incandescent light sources in several ways, including lower power consumption, longer lifetime, improved physical robustness, smaller size, and faster switching. LEDs have electrical limitations to low voltage and generally DC (not AC) power, the inability to provide steady illumination from a pulsing DC or an AC electrical supply source, and lower maximum operating temperature and storage temperature in exchange for these generally favorable characteristics. Unlike LEDs, incandescent lamps may be constructed to operate at virtually any source voltage, can use AC or DC interchangeably, and can deliver steady illumination at frequencies as low as 50 Hz whether driven by AC or pulsating DC. While an incandescent bulb may and frequently does function directly from an unregulated DC or AC power supply, LEDs frequently require the usage of electrical support components.

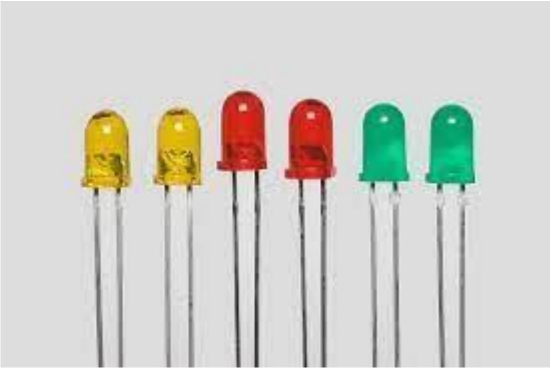

Fig 4.2.8 LED

4.3 SOFTWARE USED

4.3.1 Arduino IDE:

The Arduino IDE is a free and open-source tool that allows you to generate and upload code to Arduino boards or ESP32 boards. The IDE application is compatible with a wide range of operating systems, including Windows, Mac OS X, and Linux. It is compatible with the programming languages C and C++. IDE is an acronym for Integrated Development Environment. Sketching is the process of developing a program or code in the Arduino IDE. To upload the sketch written in the Arduino IDE software, we must link the Genuino and Arduino board to the IDE. The drawing is saved with the. In extension. The IDE creates a Hex file when a user writes code and compiles it. (Hex files are Hexadecimal files that Arduino can comprehend) and then uploaded to the device via USB. Every Arduino board contains a microcontroller, which receives the hex file and executes it.

4.3.2 IFTTT

IFTTT derives its name from the programming conditional statement “if this, then that.” What the company provides is a software platform that connects apps, devices, and services from different developers to trigger one or more automation involving those apps, devices, and services. The automation is accomplished via applets — which are sort of like macros that connect multiple apps to run automated tasks. You can turn on or off an applet using IFTTT’s website or mobile apps (and/or the mobile apps’ IFTTT widgets). You can also create your applets or make variations of existing ones via IFTTT’s user-friendly, straightforward interface.

CHAPTER-5

RESULTS AND DISCUSSION

5.1 RESULTS

The results obtained are as follows:

- The gadget detects the motion and generates the exact message matching the particular direction of motion, allowing patients to communicate their basic demands simply by moving their hands.
- Visual and auditory alarms notify the attendants and doctors whenever a message is being conveyed through the device by the patient.
- If the patient is in an emergency scenario, he or she can use this device to send a message to the doctor's mobile phone by moving his or her hand in a specific direction.

Fig 5.1.1 prototype

When the prototype is powered on. The LCD screen starts glowing.

Fig 5.1.2 When there is no movement

The LCD starts showing a message “**Nothing**” when the glove which will be worn by the patient shows no movement.

Fig 5.1.3 When the patient tilts his hand towards the right

The LCD pops up a message “ **Need food** ” , when the glove worn by the patient is tilted towards the right.

Fig 5.1.4 When the patient tilts his hand towards left

The LCD pops up a message " **Need water** " when the glove worn by the patient is tilted towards the left.

Fig 5.1.5 When the patient tilts his hand downwards

When the patient tilts his hand downwards, the LCD screen displays the word " **Call attendant** "**,** indicating that if there is an emergency, the caregiver or the doctor will be able to interpret it quickly.

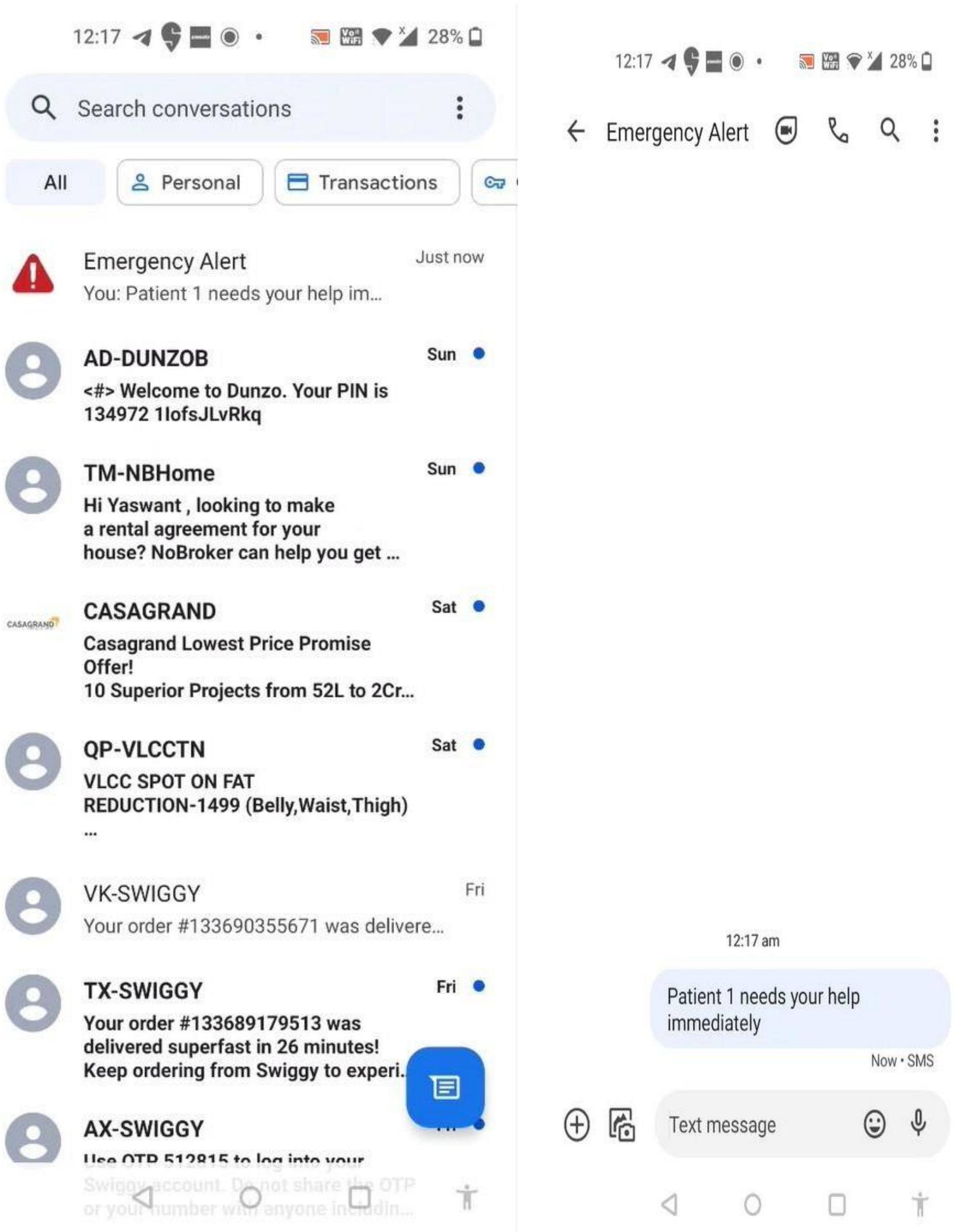

Fig 5.1.5 When the patient tilts his hand downwards

When the patient tilts his hand downwards, the esp32 not only displays a message on the LCD screen, but it also sends a message to the doctor's or attendant's mobile phone, as shown in the image above.

Fig 5.1.6 When the patient tilts his hand upwards

When the patient tilts his hand upwards the LCD screen shows the message “**Need to go to the washroom** ” so that the caretaker can prepare Hygenic necessities.

5.2 DISCUSSION

The section provides a review of applications of ambient sensors and systems used in this project. According to the review of this project, we came to know that this device will have a success rate probability of 90.1%. The screenshot of the outputs has been displayed above.

CHAPTER-6

SUMMARY AND CONCLUSION

6.1 SUMMARY

An accelerometer detects the angle of the patient's hand movement and a microcontroller analyses this data to determine the angle and direction of the hand movement.

- After that has been determined, the microcontroller generates a specific message for that direction, which it will then send to the LCD panel (16X2) to be shown on it.
- When the gadget generates a "Call attendant" message based on the hand position, a message is sent to the doctor's mobile phone.

- This device contains both visual and auditory alarms to notify the patient's attendant that the patient is attempting to convey his needs to the attendant via this device.

6.2 CONCLUSION

Finally, this device has solved the major problem faced by paralyzed patients, which is their inability to communicate with their caretakers even to fulfil their most basic needs, and it has also provided a way for patients to notify the doctor when they require assistance or help.

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APPENDIXES

```
/*******

  This is a simple demo of sending and receiving some data.
  Be sure to check out other examples!
 *******/

// Template ID, Device Name and Auth Token are provided by the Blynk.Cloud
// See the Device Info tab, or Template settings
#include <Adafruit_MPU6050.h>
#include <Adafruit_Sensor.h>
#include <Wire.h>
#include <LiquidCrystal.h>
#include <WiFi.h>

const char* ssid = "Name of your wifi network";
const char* password = "Password of your wifi network";



const char* host = "maker.ifttt.com";
// This function sends Arduino's uptime every second to Virtual Pin 2.
const int rs = 16, en = 17, d4 = 18, d5 = 19, d6 = 15, d7 = 23;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
Adafruit_MPU6050 mpu;
long int time0;
int count = 0;
int xdata = 0;
int ydata = 0;
int led=4;
int     w=0;
void setup()
{
```

```
// set up the LCD's number of columns and rows:
lcd.begin(16, 2);
Serial.begin(115200);
pinMode(led,OUTPUT);
while (!Serial)
  delay(10); // will pause Zero, Leonardo, etc until serial console opens

//Serial.println("Adafruit MPU6050 test!");

// Try to initialize!
if (!mpu.begin()) {
  //Serial.println("Failed to find MPU6050 chip");
  while (1) {
    delay(10);
  }
}
//Serial.println("MPU6050 Found!");

mpu.setAccelerometerRange(MPU6050_RANGE_8_G);
//Serial.print("Accelerometer range set to: ");
switch (mpu.getAccelerometerRange()) {
case MPU6050_RANGE_2_G:
    //Serial.println("+-2G");
    break;
  case MPU6050_RANGE_4_G:
    //Serial.println("+-4G");
    break;
  case MPU6050_RANGE_8_G:
    //Serial.println("+-8G");
    break;
  case MPU6050_RANGE_16_G:
    //Serial.println("+-16G");
    break;
}
```

```
mpu.setGyroRange(MPU6050_RANGE_500_DEG);
//Serial.print("Gyro range set to: ");
switch (mpu.getGyroRange()) {
  case MPU6050_RANGE_250_DEG:
    //Serial.println("+- 250 deg/s");
    break;
  case MPU6050_RANGE_500_DEG:
    //Serial.println("+- 500 deg/s");
    break;
  case MPU6050_RANGE_1000_DEG:
    //Serial.println("+- 1000 deg/s");
    break;
  case MPU6050_RANGE_2000_DEG:
    //Serial.println("+- 2000 deg/s");
    break;
}

mpu.setFilterBandwidth(MPU6050_BAND_21_HZ);
//Serial.print("Filter bandwidth set to: ");
switch (mpu.getFilterBandwidth()) {
case MPU6050_BAND_260_HZ:
    //Serial.println("260 Hz");
    break;
  case MPU6050_BAND_184_HZ:
    //Serial.println("184 Hz");
    break;
  case MPU6050_BAND_94_HZ:
    //Serial.println("94 Hz");
    break;
  case MPU6050_BAND_44_HZ:
    //Serial.println("44 Hz");
    break;
  case MPU6050_BAND_21_HZ:
    //Serial.println("21 Hz");
```

```
      break;
    case MPU6050_BAND_10_HZ:
      //Serial.println("10 Hz");
      break;
    case MPU6050_BAND_5_HZ:
      //Serial.println("5 Hz");
      break;
  }

  //Serial.println("");
  delay(100);

    Serial.begin(115200);
    Serial.println("Email from Node Mcu");
    delay(100);
    delay(1000);

   connectWiFi();
}

void loop()
{



while((!(WiFi.status() == WL_CONNECTED)))
    {
      connectWiFi();
    }
      WiFiClient client;
      const int httpPort = 80;
      if (!client.connect(host, httpPort))
      {
         Serial.println("connection failed");
         return;
```

```
   }
 // You can inject your own code or combine it with other sketches.
 // Check other examples on how to communicate with Blynk. Remember
 // to avoid delay() function!
 lcd.clear();
 /* Get new sensor events with the readings */
 sensors_event_t a, g, temp;
 mpu.getEvent(&a, &g, &temp);

 /* Print out the values */
 //Serial.print("Acceleration X: ");
 /* Serial.print(a.acceleration.x);
   Serial.print(",");
   Serial.print(a.acceleration.y);
   Serial.print(",");
   Serial.println(a.acceleration.z);*/

// long int time0;
// int count = 0;
 xdata = (a.acceleration.x);
 Serial.println(xdata);
 if(xdata >3)
 {
   Serial.println("Need water");
   lcd.print("Need Water      ");
   digitalWrite(led,HIGH);
   w=0;
 }
 else if (xdata<-3)
 {
   Serial.println("Need food");
   lcd.print("Need food       ");
   digitalWrite(led,HIGH);
   w=0;
```

```
 }
  ydata = (a.acceleration.y);
 Serial.println(ydata);
 if(ydata >3)
 {

   Serial.println("Need to go to washroom");

   lcd.print("Need to go ");
   lcd.setCursor(0,2);

   lcd.println("to the washroom.");
   digitalWrite(led,HIGH);
   w=0;



 }
 else if (ydata<-3)
 {
   Serial.println("Call attendant");
   lcd.print("Call attendant");
   digitalWrite(led,HIGH);
   if(w==0)
   {String url =
"/trigger/emergency/json/with/key/fxXNtaG7jFiTxoiDFGMZbR7MX6666jtyhgui8yuh8"
;
          Serial.print("Requesting URL: ");
          Serial.println(url);
          client.print(String("GET ") + url + " HTTP/1.1\r\n" + "Host: " + host + "\r\n" +
"Connection: close\r\n\r\n");
          w=w+1;
          }
```

```
}
else if (ydata==0 and xdata==0)
{
   Serial.println("Nothing");
  lcd.print("Nothing");
  digitalWrite(led,LOW);
  w=0;
}
else if (xdata<3 and xdata>-3)
{
   Serial.println("Nothing");
  lcd.print("Nothing");
  digitalWrite(led,LOW);
  w=0;
}
else if (ydata<3 and ydata>-3)
{
   Serial.println("Nothing");
  lcd.print("Nothing");
  digitalWrite(led,LOW);
  w=0;
}

//Serial.println(" m/s^2");

//Serial.print("Rotation X: ");
//Serial.print(g.gyro.x);
//Serial.print(", Y: ");
//Serial.print(g.gyro.y);
//Serial.print(", Z: ");
//Serial.print(g.gyro.z);
//Serial.println(" rad/s");

//Serial.print("Temperature: ");
```

```
  //Serial.print(temp.temperature);
  //Serial.println(" degC");

  //Serial.println("");

  delay(5);

    while((!(WiFi.status() == WL_CONNECTED)))
    {
      connectWiFi();
}
}
void connectWiFi()
{
  int i=0;
  Serial.println("Connecting to WIFI");
  WiFi.begin(ssid, password);
  while((!(WiFi.status() == WL_CONNECTED)))
  {
    Serial.println(" - ");
    i++;
    delay(300);
    if( i>10 )
    {
     connectWiFi();
    }
   }
   Serial.println("");
   Serial.println("WiFi connected");
}
```