

# WEARABLE HEALTH CARE AND MULTI-SENSOR GESTURE RECOGNITION FOR PARALYSIS PATIENTS.

Mr.D.Madhusudan<sup>1</sup>, D.Tharushan kumar<sup>2</sup>,D.Karthik reddy<sup>3</sup>, J.Divya sree<sup>4</sup>

<sup>1</sup>Assistant Professor, Department of Electronics and Communication Engineering, St .  
Peter's Engineering College. Hyderabad 50100

<sup>2,3,4</sup>Undergraduate Student, Department of Electronics and communication Engineering,  
St . Peter's Engineering College. Hyderabad 50100

## ABSTRACT: -

The electronic document includes information on a Gesture-based monitoring system is a device that patients with partial paralysis. The apparatus developed and The notion was first presented by RAY Health Tech. The technical description of the built-in gadget, the physics, and the electronic components of the monitoring are then given after the initial justification for paralysis.

**Keywords:** - RAY Healthtech, Partial paralysis, Monitoring

## INTRODUCTION

Written in Egypt in 3000 BC, Edwin Smith's Surgical Papyrus depicts a condition known as paralysis or paraplegia. It was initially thought to be a spinal injury. The most common causes of paralysis include strokes, spinal cord injury, and neck fractures. autoimmune diseases like Guillain-Barre Syndrome and neurological conditions like Amyotrophic Lateral Sclerosis are further causes of paralysis. The four most common types of paralysis are quadriplegia, hemiplegia, paraplegia, and monoplegia. Having total paralysis is no longer necessary [1]. Because the affected person cannot be constantly kept an eye on for assistance or support, a serious health chamber can declare an emergency. The concept of a wearable watch On paralysis, research is being done. Wearable watches are vital for paralysis given the modern situations. Given the cutting-edge circumstances, wearable watches are crucial for paralysis. The current environment helped us make the decision to develop the gesture-based monitoring device. At initially, a spinal injury was assumed to be the cause. damage to the spinal cord are the most frequent causes of paralysis. The most common causes of paralysis are strokes and damage to the spinal cord. accidents and a broken neck. Nerve conditions like ALS, autoimmune diseases, and other neurological issues There are further reasons, such as the paralysis caused by Gillian- Barre syndrome. Previous stroke sufferers are also more likely to intensify an ischemic stroke. those who have had a previous stroke or whose families have a history of the disease. Both men and women are more likely to have an ischemic stroke if they are black compared to people of other races or ethnicities. Risk rises as people age. A cranial CT scan is used to assist distinguish between ischemia and non-ischemic disorders.

stroke from other brain tissue-damaging conditions like a haemorrhage or an intellect tumour. If the patient has an MRI, that is the precise approach to identify an ischemic stroke. identify the underlying audiology of the ischemic stroke. The primary treatment goals are to improve breathing, heart rate, and blood pressure. Circulation The blood pressure has already returned to normal. The medical professional may also prescribe medication in an effort to lower cerebral pressure. Using tissue plasminogen activator (TPA) intravenously It dissolves clots and is the most widely used treatment for ischemic stroke. TPA cannot be used more than five hours after the stroke started because of the fact that bleeding may happen from it. Additionally, if you've ever experienced a hemorrhagic stroke, you're no longer permitted to use it. a recent primary operation, a brain injury, or a hemorrhage of genius.

## LITERATURE SURVEY

Every publication in the literature review for this study was read, and every member of the family was covered to check on their health in cases where the device was involved.

### SURVEY 1:

The initial review was based on discovering the most recent assistive technology being used following a stroke. This required item-searching. The use of electrical or mechanical devices during upper limb rehabilitation has

demonstrated clinical advantages that help people understand how having a stroke impacts a person's quality of life. Treatment for strokes comes with a hefty price tag. There are considerable systemic impediments that must be solved in order to fully realize the potential of assistive technologies in upper-limb stroke recovery. Prioritization must be given to expanded clinical service offerings and proof of practical technology efficacy. Stroke survivors, service providers, medical professionals, and family caregivers must work creatively and cooperatively together. to create new funding schemes, improve the design of devices, and improve knowledge and training among device producers, researchers, and assistive technology users. This study's literature review was completed by reading each and every publication considered. one of the family In the process, disease and technology have merged.

## **SURVEY 2:**

Locating the second review that is being thought about by seeing stroke victims using assistive technology that can be controlled with the mouth. Those who are seriously disabled gain from the use of assistive technology. Their quality of life will be enhanced by enabling them to participate in self-care, educational, vocational, and leisure activities. There are several reasons why the tongue is helpful. device enables a paraplegic person to use assistive technology on their tongue to manage their environment. Several of these devices Tongue Drive is a brand-new experiment. been made public. the motor cortex of the homunculus The hand and fingers have a similar structure to the mouth and tongue. Contrary to the eyes, which have substantial cortical Other motor organs, such as the tongue, were fashioned. They are therefore capable of complex motor control and manipulation. obligations by definition, as demonstrated by their part in It involves both swallowing and vocalization. the skull's hypoglossal nerve in general, it links the tongue to the brain and is immune to disease and damage. TDS stands for tongue-drive system. from a distance, determine the location of the tongue in the oral cavity, and transform the movements of the tongue into a set of user-defined commands. These commands can then be used. control the user's environment, gain access to a computer, or drive a car that can accommodate wheelchairs. many magnetic sensors compose TDS. either on the left or right side of the mouth either on the outside of the mouth, adjacent to the user's cheeks, connected to a headset, or on the inside of the mouth, side of the teeth on an orthodontic brace. The detector The magnetic field of a tiny permanent magnet is detected by an array. A rice-grain-sized magnet is connected to all tissue adhesives used for tongue implantation, tongue piercing, and tongue trimming. Sensor signals are multiplexed, digitalized, and processed. wirelessly communicated to an external wireless interface to which the user is strapped, while they are using a bed or a wheelchair. A literature review is also included in this study.

## **AIM**

This is for Patients Who Are Partially Paralyzed is a non-invasive wearable device that the patient wears. This device serves as a helper when in use. Any person or family member is conveniently located close to where you live. Patients who are partially or completely paralyzed need constant help with eating, using the toilet, drinking water, and other activities. Clearly, they have trouble speaking due to the stroke. The watch is fastened to the wrist by a carer or guardian to make things easier. They are knowledgeable about the patient's needs.

### **i. Issue Description:**

A blockage in the brain is the main cause of an ischemic stroke. clots brought on by the brain's arteries in keeping with According to the Indian Stroke Association, almost 100% more strokes have occurred in India over the last three decades. Around 1.8 million Indians battle a variety of diseases. Numerous people have strokes every year, and only early medical attention can save their lives. reduced mortality and morbidity. The patient cannot be regularly checked for any potential support or aid. In an emergency, this may result in many serious health problems.

### **ii. Existing Alternative:**

People who are seriously disabled benefit from assistive technology. enhance their quality of life by allowing them to participate in Self-care, educational, vocational, and recreational pursuits are all important. The tongue has several features that make it useful. device for influencing the surroundings of paraplegic persons via tongue-operated assistive devices. A four-wheel walker and rotators assist the patient in moving about. requests assistance and steer the wheelchair with his head The joystick is used to control movement.

### iii. Working of Device:

Making Motions by Partially paralyzed individuals cause their hand gestures to convey the requests that they are making. If the patient moves his hand towards right indicate he needs water, left side indicates patient needs food, forward indicates medicine and backwards indicates the patient want to go to wash room

## THE APPROACH

In the design phase, the fewest body moments in an example with incomplete paralysis are found using a gyroscope. The conservation of angular momentum governs the operation of a gyroscope detector. It works by continuing to initiate angles. A rotor, or spinning wheel, is positioned on a pivot in a gyroscope detector. The gyroscope will keep pointing in the same direction no matter how we rotate the rotor.

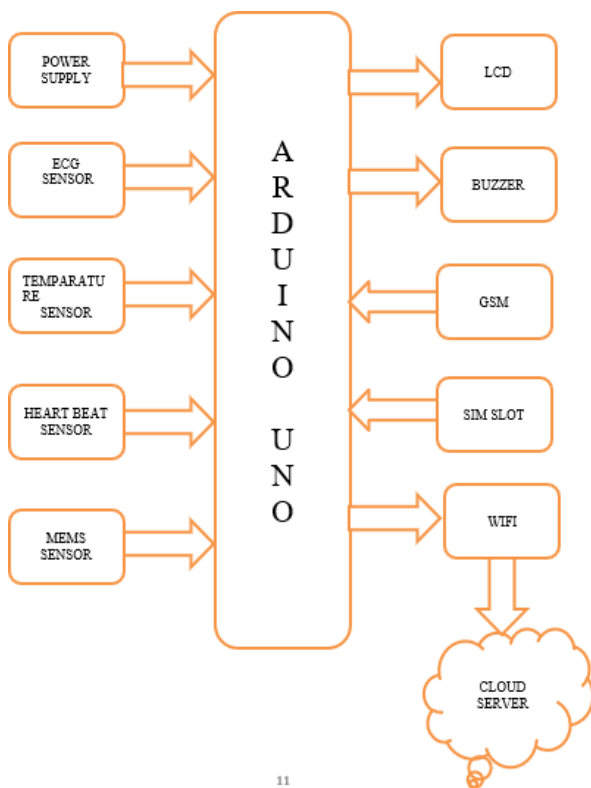


Fig 1: Block Diagram

## THE PROCEDURE

- A. The hand stirring of the casing is detected by the MPU6050 (accelerometer and gyroscope) detector. Only the acceleration is then picked up, which is enough to follow the case's motion.
- B. The ESP32 microcontroller receives the data in step two. It uses the widely used I2C (Inter-Integrated Circuit) protocol for communication.
- C. The ESP32 analyses the data and determines whether there is hand motion to the left, right, over, or down. If a gesture is recognized, the acceleration value and specific gesture are sent to the Firebase Realtime Database.
- D. A few initial steps must be followed before ESP32 may connect with Firebase. To transfer additional data, the ESP32 must be fed with the stoner's login credentials; failing to do so reduces device security and the stoner's ability to escape.
- E. Our website retrieves the data from Firebase and must now bring and send it to the stoner. The same login information that was provided to the ESP32 must be entered on our website.
- F. The website alerts the guardian or caretaker's phone, making it simple to handle the matter.

### **A. Why ESP32 as the Microcontroller?**

The ESP32 includes Bluetooth and Wi-Fi communication capabilities, which are the main requirements for the Gesture Grounded Tracker's wireless data transfer. As a result, no additional module is required for data transfer. Wi-Fi SSIDs and passwords and login credentials are among the authenticated credentials that can be transmitted via Bluetooth. One of the essential elements of wearable or IoT (Internet of Things) bias is the capacity to operate on batteries. The ESP32 initially only requires redundant current to connect to Wi-Fi and gather the IP address. A coprocessor with ultra-low power (ULP) is present. When a gesture is detected via an external event, the CPU can switch to regular mode, and data can be posted to the Firebase Realtime Database.

### **B. Gesture Grounded Tracker Use Instructions**

1. It is crucial that the carers go to the Ray Healthnet website to purchase the gesture-grounded stir shamus as instructed. Accessible at <https://shaft-health-tech.vercel.app>. The guardian or caretaker must check in on the internet and enter their information as well as case specifics.
2. The next step is to link the device being used—a phone or tablet—with the grounded gesture examiner. Bluetooth and Wi-Fi are used for this connection.
3. After configuring the watch and phone, the shamus can be linked to partially paralyzed cases.
4. The watch will make an alarm sound when the user moves his hand, and the phone or tablet will likewise sound an alert.

### **C . Subsystems' abstract specifications**

#### **1. ESP32( WIFI and microcontroller) →**

1. To manage the entire operation. A binary-core Ten silica Extends LX6 microprocessor powers the low-cost, low-power ESP32 microcontroller series, which also has Wi-Fi The ESP32 microcontroller's specifications, functionality, and programming details are introduced in this paper along with comparisons to some of its rivals. The system memory consists of two 16KB RTCs, 520KB SRAM, and 448KB ROM.

#### **2. Microcontroller and Wi-Fi-equipped ESP 32**

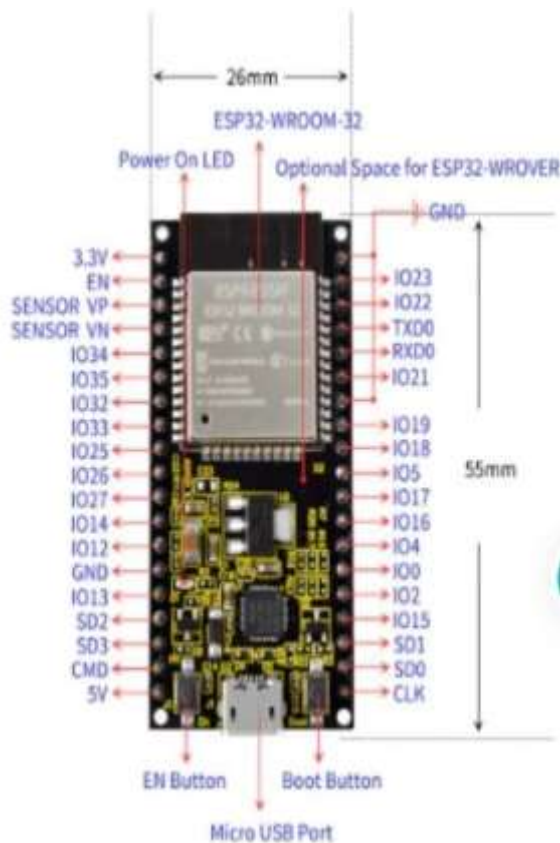


Fig :- ESP32( wifi and microcontroller)

## 2. MPU6050 Accelerometer and Gyroscope →

With 16-bit analog-to-digital conversion circuitry on each channel, the gyroscope and accelerometer can measure x, y, and z. The MEMS accelerometer and gyroscope are then integrated on a single chip, and the communication protocol used is I2C, a multi-master, a multi-slave, single-ended, periodic computer system with moderate speed but high mileage due to the use of only two wires.



Fig :- MEMS Sensor

## 3. Real-time database using Firebase

Data publication and recovery A platform for creating web operations is called Firebase. It supports the development of high-quality apps by inventors. It stores information in JavaScript. The operation inventor is given an API that allows operation data to be accompanied among guests and stored in Firebase's pall. Firebase Auth- To authenticate the stoner for sequestration Facebook, Google GitHub, and Twitter are among the social login providers supported by Firebase Auth. It's a decoration service that allows druggies to be authenticated using solely customer-side law. It also offers a stoner operation system that allows inventors to work dispatch and word logins stored in Firebase for stoner authentication. Firebase Fire store- Store stoner

important details It stores the information as a JSON train. This type of storehouse helps to store the details of the stoner like name, age, etc. And stores the important gesture commands.

## RESULTS

The efforts that we make to take care of our loved on who has been effected or got an attack would be successful only when we keep an eye on their regular medical status. This device also reads and stores the data in cloud which can be use in future to treat patient as shown below.



Time	Temp	HR	SpO2	ECG	ECG	ECG	ECG
11:40	37.5	72	98	0	0	0	0
11:45	37.5	72	98	0	0	0	0
11:50	37.5	72	98	0	0	0	0
11:55	37.5	72	98	0	0	0	0
12:00	37.5	72	98	0	0	0	0
12:05	37.5	72	98	0	0	0	0
12:10	37.5	72	98	0	0	0	0
12:15	37.5	72	98	0	0	0	0
12:20	37.5	72	98	0	0	0	0
12:25	37.5	72	98	0	0	0	0
12:30	37.5	72	98	0	0	0	0
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23:40	37.5	72	98	0	0	0	0
23:45	37.5	72	98	0	0	0	0
23:50	37.5	72	98	0	0	0	0
23:55	37.5	72	98	0	0	0	0
00:00	37.5	72	98	0	0	0	0

Fig: Health report of patient

It also has a graphical view of this report which makes the doctors to understand the patient’s health status so that they can treat easily.

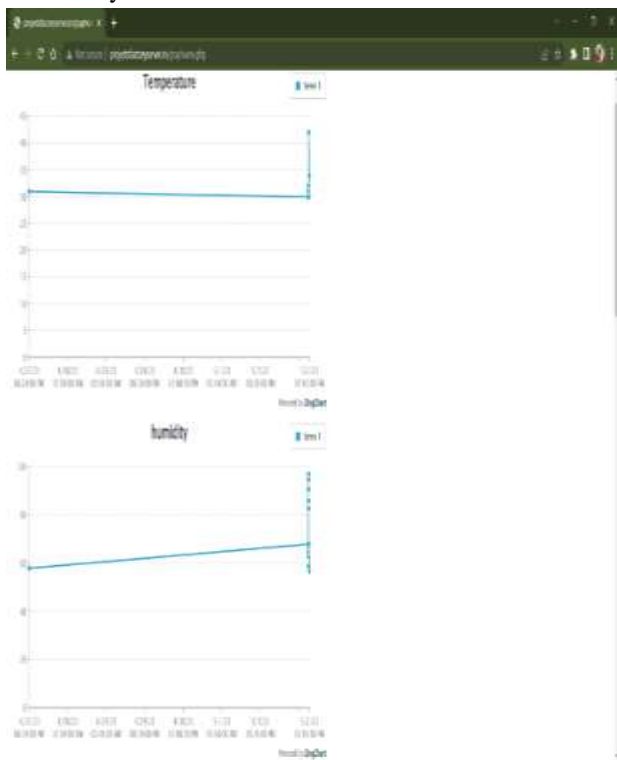
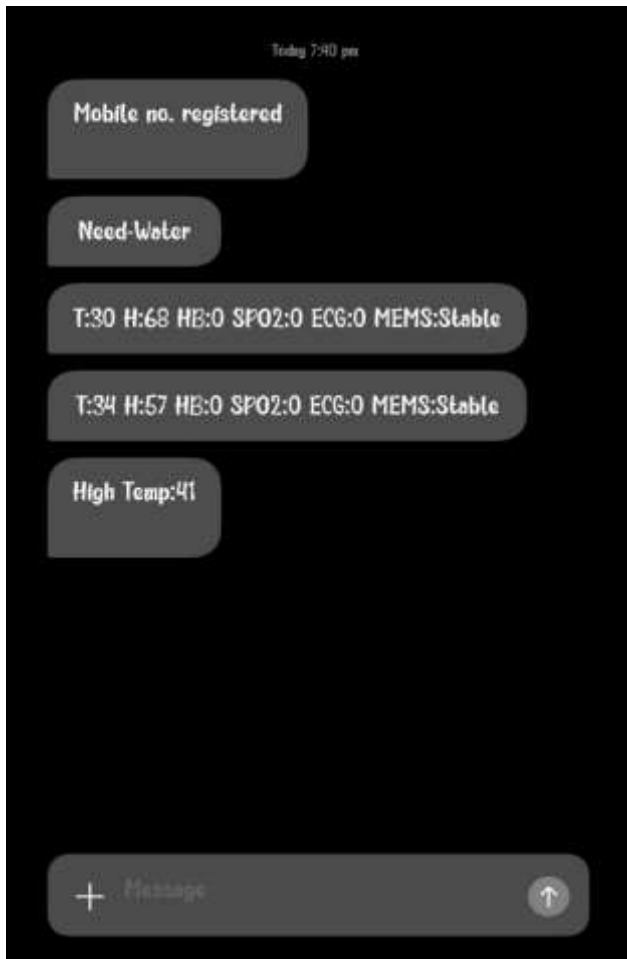


Fig: graphical view of report

In case of abnormal conditions like high temperature, high blood pressure or low ECG levels would be detected and an alert message is sent to the care taker and also displayed on LCD display. It also detects the motion of patient and it messages their need.



**Fig: SMS alert!**



**Fig: message displayed on LCD display**



## CONCLUSION

In the present proposed result, MPU6050 has been connected to the ESP32. The data from MPU6050 is transferred to ESP32 and also is published to Firebase Real-time Database. Using this data, the caretaker is alerted through our website. The website can change the user's commands and particular details. It's published on the internet through a provider called Vernell.

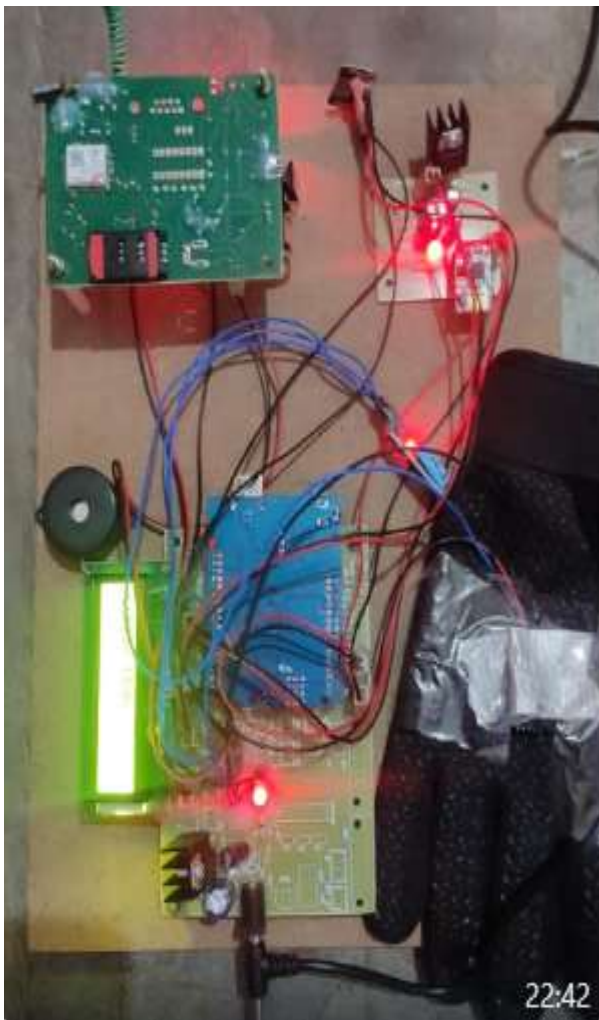


Fig : Project kit

## FUTURE SCOPE

As banded, IOT-grounded non-invasive health vital monitoring will play a major part in the field of healthcare. In this busy world, having a person devoted only to covering a case is hardly possible. Having said the disadvantages and problems that physical monitoring possesses, it's always a great advantage in having a remote covering system. Hence, the device we've developed will have great eventuality in the healthcare request. By using machine literacy- suchlike algorithms, the device can be developed into an indeed more effective non-invasive monitoring system.

## ACKNOWLEDGMENT

Cooperation leads to success is what we at RAY Healthtech believe. We, the platoon of RAY, have supported one another in doing the Gesture grounded Motion shamus for incompletely Paralyzed cases. During the trip of this design, we'd like to thank all our Professors and Head for guiding and supporting us. originally, we'd like to thank our Head of



Department Dr. Joshi Manisha S for furnishing us with the occasion to work on this design. We'd also like to thank our companion Joshi Manisha S for her guidance and precious advice at every single stage of the design.

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