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# IoT Based Paralyzed Patient Healthcare

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**Abstract**— In order to improve healthcare services for patients with paralysis, this project suggests an Internet of Things (IoT) based solution. Paralysis is a medical condition that can arise from a variety of disorders, including stroke and spinal cord damage. In order to manage consequences and enhance quality of life, paralysis frequently requires ongoing monitoring and prompt intervention. The system uses Internet of Things (IoT) technology to combine several sensors and devices to monitor environmental conditions, activity levels, and vital signs in real time. The gathered information is safely sent to a central monitoring station, where machine learning techniques are used to examine it and look for anomalies or possible health concerns. Through an intuitive interface, caregivers and medical professionals are provided with timely alerts and insights, facilitating proactive intervention and individualized care. Our IoT-based solution offers immediate intervention and ongoing monitoring.

**Index Terms**—Hand Gesture Recognition, Hand Gloves, LCD Display, Message Convey, Message Display, Paralyzed, Telegram Bot.

## 1. INTRODUCTION

The impact of paralysis on individuals can be profound, affecting their ability to move and even feel certain parts of their body. Conditions such as spinal cord damage, stroke, and multiple sclerosis are common causes of paralysis, leading to a range of mobility limitations and loss of independence. Unfortunately, many paralyzed individuals are left without adequate care or support, with caregivers often neglecting their needs.

To address this issue, there is a pressing need for innovative solutions that empower paralyzed individuals to communicate with their caregivers and monitor their health in real-time. One proposed solution is the

development of wearable technology integrated with IoT capabilities. This technology enables patients to connect with healthcare providers and family members remotely, facilitating timely assistance and monitoring of their condition.

The IoT-based paralyzed patient healthcare system utilizes electronic components centered around a microprocessor, including reception and broadcasting circuitry and hand gesture detection circuits. By employing accelerometers, this system can identify arm movements and transmit data wirelessly to a central server, allowing for remote monitoring and analysis of patient movements and health status.

The inability to move muscles purposefully and independently, known as immobility, can have significant consequences for paralyzed individuals. While therapy aims to help individuals adapt to life with paralysis, there remains a need for accessible and cost-effective solutions to aid mobility rehabilitation.

One such solution involves the development of a gadget capable of retraining a patient's mobility while being affordable and user-friendly. This gadget utilizes sensors to detect the user's movements, allowing them to communicate messages by simply tilting the devices at specific angles. This technology not only assists with communication but also ensures prompt attention to the patient's needs, thereby improving overall health outcomes.

By empowering paralyzed individuals to communicate and request assistance through simple gestures, this technology promotes independence and enhances quality of life. Moreover, its affordability and lightweight design make it accessible to regain mobility and autonomy without financial burden.

By continuously monitoring patient movements and health metrics, such systems can provide valuable insights for healthcare providers, enabling personalized treatment plans and proactive intervention strategies. Furthermore, the integration of artificial intelligence and machine learning algorithms holds promise for optimizing rehabilitation programs and predicting health outcomes, ultimately enhancing the effectiveness of care delivery for paralyzed patients.

As technology leaders, it is our responsibility to continue innovating and developing new solutions to improve the lives of paralyzed individuals. By leveraging microprocessor technology and IoT capabilities, we can create transformative tools that address the unique challenges faced by this populations and promote greater independence and inclusion.

## 2. LITERATURE REVIEW

The literature surveys contribute to Knowledge construction by synthesizing existing research findings and identifying research gaps, literature surveys contribute to the construction in the field. They lay groundwork for advancing understanding and generating new insights through empirical research. In 2016, R. Kumar et al. [1] proposed a paper where it integrates various sensors to gather vital signs, transmitting the data to a server for analysis. Utilizing Wi-Fi for data transfer and a web interface for visualization, the system enables real-time monitoring at a low cost. Authors underscore their potential to enhance healthcare accessibility and reduce hospitalization rates, while also addressing challenges like data security and scalability, offering valuable insights for advancing remote patient monitoring. In 2016, M. S. Hossain et al. [2] investigated various approaches and technologies for monitoring patient's health within smart home environments. Its reviews existing methods for data collection, analysis, and communication to provide insights into the development of efficient monitoring systems. The author's work highlights the significance of integrating advanced technologies into healthcare to enhance patient monitoring and improve overall well-being. In 2016, Abhijeet Botre et al. [3] presented an assistance system designed to help paralyzed individuals in their daily lives. It focuses on using electrical, electronics, instrumentation, and control engineering to create innovative solutions. This paper explored methods to aid paralyzed

individuals with tasks they may find challenging. This aimed at enhancing the quality of life for people living with paralysis.

In 2017, Deepasri et al. [4] presented an innovative approach to monitoring paralysis patients health using automated system. The authors propose a system that integrates various sensors and IoT technology to continuously monitor vital signs and detect abnormalities. Through real-time data transmission and analysis, the system facilitates prompt medical intervention, thus improving patient outcomes and quality of care. The author demonstrated the feasibility and effectiveness of their approach in enhancing healthcare delivery for paralysis patients. In 2018, Shubham Banka et al. [5] explored the application of IoT in gathering real-time health data, analyzing it, and facilitating remote patient monitoring. It emphasizes the potential of IoT technologies to enhance healthcare services by providing timely interventions and improving overall patient care. The study underscores the importance of integrating IoT into healthcare systems to achieve efficient and effective monitoring, leading to better patient outcomes and optimized resource utilization. In 2018, Milan Pandey et al. [6] presented the system which utilizes technology to interpret eye movements as commands for controlling various devices. This innovative approach aims to empower paralyzed individuals to interact with their surroundings and perform tasks using only their eyes. This research highlights the potential of technology to improve independence and quality of life for people with paralysis. In 2019, S. A. C. Aziz et al. [7] presented the innovation approach in which system employs movement gesture sensors to provide automated healthcare instructions tailored for paralyzed patients. This technology aims to enhance accessibility to healthcare resources and improve the quality of care for individuals with paralysis, representing a significant advancement in assistive technology. By leveraging motion sensing technology, the system offers a user-friendly and efficient means of delivering essential healthcare guidance, addressing the unique needs of this population. In 2020, V. Viancy et al. [8] discussed the implementation of Internet of Things (IoT) technology in monitoring paralyzed patients. The authors explored the potential of IoT devices in enhancing healthcare by continuously monitoring vital signs and providing real-time updates to medical professionals. They highlight the significance of such equipment in improving patient care and reducing the risk of complications. Through their research, they demonstrate the feasibility and effectiveness of IoT-based solutions in healthcare, particularly in the context of paralyzed patient monitoring. Their findings contribute to the advancement of medical technology and patient-centric care. In 2020, N. Birbaumer et al. [9] introduced the Thought Translation Device (TTD) for completely paralyzed patients, facilitating communication and control via brain signals. The device translates these signals into actionable commands, promising improved quality of life for individuals with severe motor disabilities. Here this paper underscores the significance of TTD in assistive technology. By enabling interaction with external devices, TTD offers a breakthrough solution for paralysis, highlighting advancements in neurotechnology and its potential impact on enhancing autonomy and communication for those with profound physical limitations. In 2021, Ms. N. Renee Segrid Reddiyar et al. [10] proposed a novel which aimed at improving the quality of life for paralysis patients. By utilizing sensors for temperature, pulse rate, and movement detection, the system enables continuous health monitoring and communication through hand gestures. In emergencies, alerts are triggered to ensure timely assistance. This affordable and user-friendly system enhances patient independence and overall well-being, addressing the unique needs of individuals with paralysis. In 2021, Prajakta A. Jadhav et al. [11] presented the system utilizing microcontroller-based circuitry to monitor patient health parameters like heartbeat. It includes patient and doctor logins for remote monitoring and alerts. The system benefits paralyzed, elderly, and temporarily disabled individuals. Hardware components include sensors, relay board, ESP32 microcontroller, and electrical devices. The system’s web interface allows enrockment as admin, patient, or

doctor. Results show temperature and pulse sensor readings for monitoring patient health. In 2023, Shanmugaraj et al. [12] discussed a paper in which it introduced a low-cost communication device for Hemiplegia, Monoplegia, and Paraplegia patients, aiding in expressing needs. The system includes sensors for temperature, pulse, and eye movements, alerting caregivers in emergencies. The device, based on a microcontroller, sends messages to caretakers and doctors. It aims to enhance patient monitoring, communication, and overall healthcare outcomes.

## 3. PROBLEM FORMULATION

Hospital patients have different needs that include emotional, physical and practical aspects. Research shows that patients' top priorities are confidence, communication, access to information and learning opportunities. In addition, they need help with their health care needs and emotional support to navigate their hospital experience. Urgency is paramount in addressing basic needs such as hydration, nutrition and access to facilities such as bathrooms. Partial or total immobility due to injury or illness worsens physical inactivity and can even cause unconsciousness, depending on the severity of the condition. Temporary immobility often results from catastrophic events, further complicating patient care.

Communication problems make the situation worse, especially when patients cannot effectively communicate their needs through traditional means. Despite physical limitations, patients can use subtle hand gestures to express their wishes and concerns. Relying on such gestures, however, reveals a deep disparity between internal states and external manifestations, highlighting the need for alternative communication strategies and increased sensitivity of care givers. Responding to these challenges requires a holistic approach that goes beyond treating physical ailments alone. Prompt and compassionate care is important not only for physical recovery, but also for mental well-being.

Creating an environment where patients feel understood, supported and ready to communicate their needs increases feelings of efficacy and overall satisfaction with the treatment experience. By recognizing and responding to the diverse needs of hospitalized patients, healthcare providers can contribute to a more positive recovery and better outcome.

## 4. METHODOLOGY

The design process typically begins with gathering requirements from stakeholders. This involves understanding the needs of users, as well as any business or technical constraints. Once requirements are gathered, they are analyzed and prioritized to identify the most critical features and functionalities. Next, the system architecture is designed. This involves defining the high-level structure of the system, including its components, modules, and their interactions. Architectural patterns such as client-server, microservices, or event-driven architecture may be employed based on the requirements and constraints of the system. After defining the architecture, detailed design of individual components and modules takes place. This involves specifying data models, algorithms, APIs, and interfaces for each component.

Step 1: The flowchart as shown in Figure 1, begin by indicates the start point.

Step 2: Heartbeat or Heat: The system checks if patient heartbeat or heat is above normal level.

If Yes: This might mean a medical urgency, and flowchart go to step 7 (call servant).

If No: Flowchart moves to step 3 (paralyzed person gesture).

Step 3: Paralyzed Person Gesture: Flowchart asks if patient is trying hand gestures.

If No: The system may think patient cannot or don't want to use hand gestures to control. Flowchart go to step 8 (stop).

If Yes: Flowchart moves to step 4 (turn hand).

Step 4: Turn Hand: Flowchart find the way of hand turning.

- Turn Hand (Right): If patient turn hand right, it means emergency. Flowchart go to step 7 (call servant).
- Turn Hand (Left): Turning hand left might show patient want food and water. Flowchart go to step 5 (show message).
- Turn Hand (Up): Turning hand up could show patient need washroom. Flowchart go to step 6 (show message).
- Turn Hand (Down): Turning hand down shows patient want call servant. Flowchart go to step 7 (call servant).

Step 5: Show Message: System shows a message on patient's screen (not seen in flowchart) based on hand gesture (food/water or washroom). Might allow med staff to understand patient's ask.

Step 6: Call Servant: System makes call to servant for emergency or ask (shown by hand gesture).

Step 7: End: Flowchart reach end point, meaning one cycle ends. Likely system still keeps checking patient's vital, hand moves, and response.

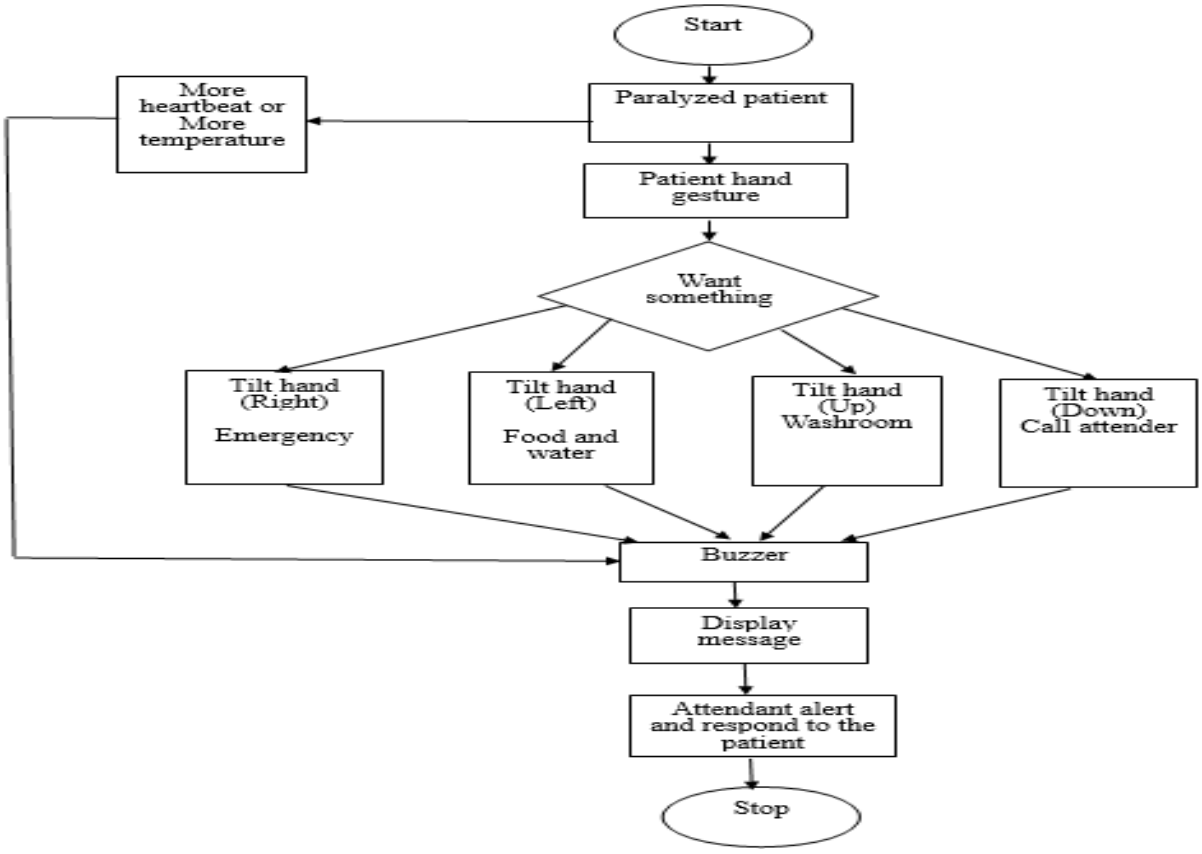


**Fig. 1: Flow chart**

## 5. RESULTS AND DISCUSSION

### 5.1 RESULTS

The purpose of this system is to continuously track the patient's vital statistics and monitor the health system of paralyzed patients. The sensors are typically attached in order to monitor the patient. The wireless communication, display devices, and sensor network are among the components involved. nodes and additional auxiliary parts Transducers, which are utilized to record every physical quantity of the patient, are what sensors are.

Figure 2 shows the project setup; this project has been built around the Arduino Nano board. It controls the peripherals like LCD display and the sensors which act as an interface between the system and the user.

As shown in the project setup, the glove is mounted with a accelerometer sensor when the user makes gestures the messages will be displayed on the phone and LCD display.

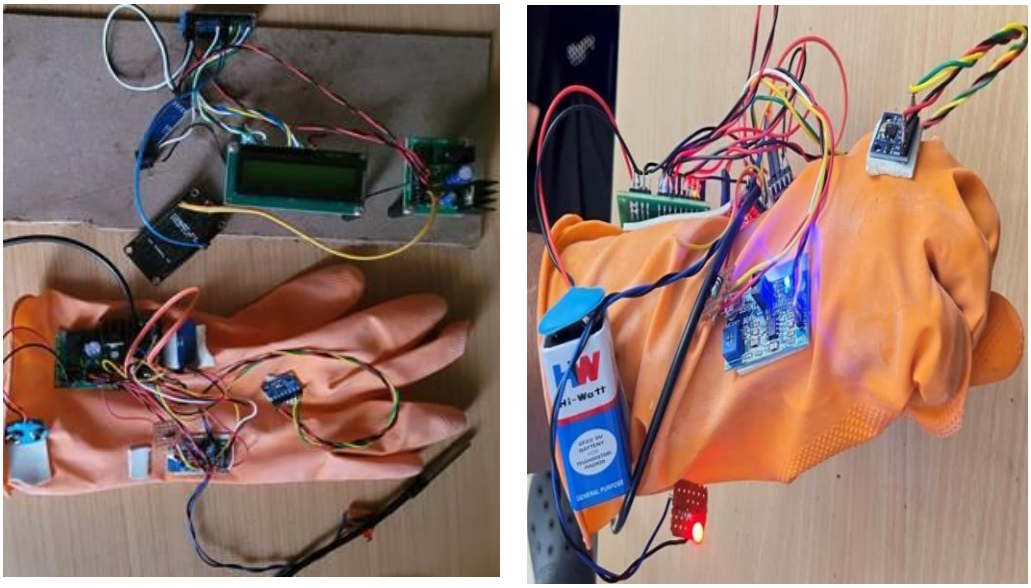

**Fig. 2: The project setup**

### 5.2 DISCUSSION

This project proposes an IoT-based healthcare system to improve monitoring and control aspects of current healthcare. While adding more sensors enhances functionality, power and complexity increase. The promising field of smart healthcare offers vast potential for future exploration. Minimizing model complexity while integrating additional sensors is key for the future. This aligns with Smart City goals of providing innovative healthcare solutions while being simple, low-energy, and real-time. The proposed system demonstrates improved healthcare quality and cost reduction by avoiding unnecessary hospitalizations and prioritizing urgent care. With potential future improvements, it can offer reliable real-time health monitoring and tracking for various vital factors.

## 6. CONCLUSION

This project proposes an IoT-based healthcare system to improve monitoring and control aspects of current healthcare. While adding more sensors enhances functionality, power and complexity increase. The proposed system demonstrates improved healthcare quality and cost reduction by avoiding unnecessary hospitalizations and prioritizing urgent care. With potential future improvements, it can offer reliable real-time health monitoring and tracking for various vital factors. In this work we framed a system that lets someone with a disability display a remark on a display screen by just moving any part of his body that can make a gesture while producing a buzzing sound. In the event that no one is present to care for the patient, this system also takes care of things by sending a message via Telegram over Zigbee expressing his intentions. Grasping the device in the moving hand's knuckles demonstrates how the device works. To convey a message, the user must bend the device at a certain angle. Depending on how the device is angled, a different message is broadcast.

## REFRENCES

[1] R. Kumar; M. Pallikonda Rajasekaran, An IoT based patient monitoring system using Raspberry Pi, IEEE, October 2016.

[2] M. S. Hossain, ‘‘Patient status monitoring for smart home healthcare,’’ in Proc. IEEE Int. Conf. Multimedia Expo Workshops (ICMEW), Jul. 2016, pp. 1–6.

[3] Abhijeet Botre et al., “Assistance system for paralyzed”, International Journal Of Innovative Research In Electrical, Electronics, Instrumentation And Control Engineering ,Vol 4, Issue 5, 2016.

[4] T. Deepasri, M. GokulPriya, G. Arunkumar, P. Mohanraj, and M. Shenbagapriya, “Automated Paralysis Patient Health Care Monitoring System”, South Asian Journal of Engineering and Technology vol. 3, No. 2, pp. 85–92, 2017.

[5] Shubham Banka, Isha Madan, S.S. Saranya, "Smart Healthcare Monitoring using IOT" published in International Journal of Applied Engineering Research, Volume 13, No 15,2018.

[6] Milan Pandey et al, “Assistance for Paralyzed Patient Using Eye Motion Detection”, Fourth International Conference on Computing Communication Control and Automation, ©2018 IEEE

[7] S. A. C. Aziz, A. F. Kadmin, N. Rahim, W. H. W. Hassan, I. F. A. Aziz, M. S. Hamid, R. A. Hamzah.” Development of automatic healthcare instruction system via movement gesture sensor for paralysis patient” published in International Journal of Electrical and Computer Engineering (IJECE) Vol. 9, No. 3, June 2019.

[8] V. Viancy, J. Avinash Wilson, and P. Anusha, “Paralyzed Patient Monitoring Equipment – IoT”, International Journal of Advanced Research in Basic Engineering Sciences and Technology, Vol.6, Issue.10, October 2020.

[9] N. Birbaumer, A. Kübler, N. Ghanayim, T. Hinterberger, J. Perelmouter, J. Kaiser, I. Iversen, B. Kotchoubey, N Neumann, H. Flor, The Thought Translation Device (TTD) for Completely Paralyzed Patients”, IEEE Transactions on Rehabilitation Engineering, vol. 8, No. 2, pp. 190-193, June 2000.

[10] Reddiyar, N. R. S., Remina, S., Sabrin, S., & Subhashini, M. (2021). IoT-based Paralysis Patient Health Care Monitoring System. Journal of University of Shanghai for Science and Technology, 23(6), 431-437.

[11] Jadhav, P. A., Jadhav, S. B., Erudkar, A. P., Bhurke, S. A., Palekar, N. S., & Pardesi, M. A. (2021). An IoT Based Approach in Paralysis Patient Healthcare System. International Journal of Engineering Applied Sciences and Technology, 6(3), 238-245.

[12] Shanmugaraj, G., Fathima, S. M., Gnapika, A., & Mohanambal, K. (2023). Enhancing Paralysis Patient Care through an IoT-Enabled Healthcare Ecosystem. Journal of Population Therapeutics and Clinical Pharmacology, 30(11), 271-280.