iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 12 **Issue:** IV **Month of publication:** April 2024

DOI: https://doi.org/10.22214/ijraset.2024.59992

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue IV Apr 2024- Available at www.ijraset.com

Design & Development of Smart System for Providing Services to Bedridden Patients

N. K. Choudhari[1], Akanksha Mungse[2], Nupur Badwaik[3], Pooja Chikate[4], Prachi Sahu[5], Muskan Ali[6]
Department of Electronics & Communication, Priyadarshini Bhagwati College of Engineering, Nagpur, Maharashtra, India

Abstract: This project research work has been carried out and the smart system has been designed and developed for providing essential services to bedridden patients. Recognizing the challenges faced by individual patients who are confined to their beds and often feel helpless and dependent, we have been motivated to contribute by developing a system to address their needs. Our goal was to alleviate their sense of unhappiness and dependence by creating a solution that offers assistance and support. The system autonomously transmit message to the mobile devices of concerned relatives or nurses based on the patient's needs, using flex sensors activated by finger movements. The flex sensors detect gestures made by the user, and Arduino processes this information to generate corresponding voice output through a mobile device in the desired language. This innovative project holds significant potential to greatly benefit society by enhancing the quality of life for bedridden patients and providing them with a sense of autonomy and assistance.
Keywords: Arduino Nano, Flex Sensor, Smart Glove.

I. INTRODUCTION

This advanced smart system glove represented a groundbreaking advancement in healthcare technology, specifically designed to cater to intricate needs of bedridden patients and their caregivers. By seamlessly facilitating communication and continuously monitoring health indicators, this innovative device not only elevates the standard of care but also fostered an environment of comfort and support for patients.

Whether in healthcare facilities or home, its wireless connectivity to a central monitoring system empowered healthcare provides and caregivers with real time data access for prompt response. Despite the challenges bedridden patients face in expressing their needs and accessing essential services, and the caregiver's struggle to provide timely assistance and monitor vital signs discreetly, this system ensures that patients received impeccable care, tailored to their physical and emotional well-begin.

II. LITERATURE REVIEW

The design and development of smart gloves for bedridden patients represented a promising avenue for improving patient care and enhancing communication between patients and caregivers. This literature review aims to explore existing research and projects related to this field, focusing on the integration of components such as LCD, Arduino Nano, voltage regulator, flex sensor, temperature sensor, pulse sensor, Node MCU, and 8-channel voice recorder.

Heera et al. developed a system incorporation sensor technology embedded within a glove to detect gesture made by bedridden patients. The detected gestures were translated into speech output through the utilization of a Bluetooth module paired with an Android smartphone. This innovative approach aimed to facilitate communication and interaction between patients and caregivers. [1-3-7]

Patel et al. introduce a smart glove system integrating flex sensors and Arduino Nano for gesture recognition. Their study focused on developing a user-friendly interface that allowed bedridden patients to communicate their needs through recognized gestures. By leveraging Arduino Nano's capabilities, the system achieved accurate gesture recognition and seamless interaction between patients and caregivers.

Brown, M., & Clark, L.: Brown & Clark developed a smart glove with temperature and pulse sensors for continuous health monitoring of bedridden patients. Their study focused on integrating sensors capable of monitoring vital signs and displaying real-time data on an LCD screen. The system aimed to improve patient care by providing caregivers with accurate and timely information about patient health status. [4-8]

Ahmed et al. designed a system employing flex sensors integrated into a glove to recognise hand gestures made by bedridden patients.

The analog output of the flex sensors was fed to an ATMEGA32L microcontroller, which detected predefined gestures and produced corresponding speech messages. This approach facilitated seamless communication between patients and caregivers. [2-5-9]

Recent advancement in wearable technology have led to development of smart glove with enhanced sensor accuracy, wireless connectivity capabilities, and user-friendly interfaces. Integration of components such as Node MCU enables real-time data transmission and remote monitoring, thereby improving accessibility and usability of smart glove system.

Despite the progress made in smart glove development, challenges such as sensors calibration, power efficiency and user interface optimization remained. Future research endeavours may focus on exploring advanced sensor technology, implementing machine learning algorithm for gesture recognition and refining power-efficient communication protocols to address these challenges effectively.

III. SYSTEM REQUIREMENTS

The smart system for bedridden patients integrates various hardware components to monitor and enhance the healthcare experience for patients and caregivers alike.

A. Arduino Nano

In wearable project like smart gloves power efficiency remains important to ensure extended battery life Arduino Nano's low power consumption makes it suitable for such applications, even in an enhanced version with additional functionalities. The core processing unit responsible for controlling and coordinating all system functionalities, ensuring efficient operation and data management. It contains 22 input and output pins there are 6 analog pins A0 to A5 and 14 digital pins D0 to D13. It consumes 19 mA power. It has 32 Kb flash memory. Its clock speed is 16MHz.

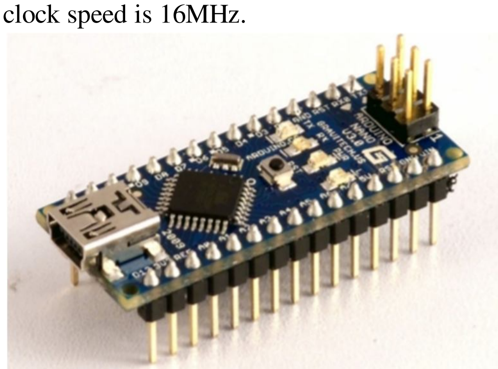


Fig.1: Arduino Nano

B. Node MCU (ESP8266)

Node MCU is an open-source firmware and development kit that helps you to prototype IoT products. Facilitates wireless connectivity, enabling remote monitoring of patient health parameters and real-time communication with caregivers for prompt intervention if needed. Operating voltage is 3.3V, digital I/O pins: 11GPIO pins, analog input pins: 1ADC pin, memory: 128KB(RAM), flash memory: (4MB),

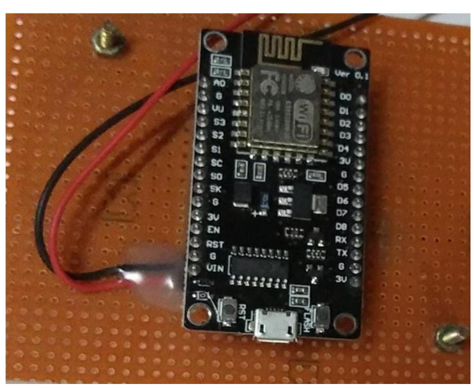


Fig.2: Node MCU

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue IV Apr 2024- Available at www.ijraset.com

C. LCD Display

An LCD (Liquid Crystal Display) is a type of flat-panel display that uses the light-modulation properties of liquid crystal. 16*2 LCD display consists of 2 rows and each row consists of 16 characters. It provides a clear and user-friendly interface for caregivers to view vital patient information, including health metrics and alerts, ensuring easy interpretation and timely response.

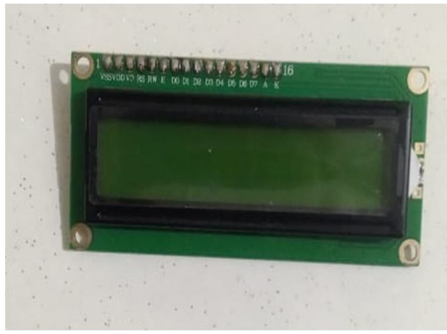


Fig.3: 16*2 LCD Display

D. Voltage Regulator:

The LM7805 is a voltage regulator integrated circuit (IC) that regulates a stable 5v output from higher input voltage. Ensure stable power supply to all components, safeguarding against voltage fluctuations and ensuring uninterrupted operation of the smart system. Input voltage range: around 7v to25v, output voltage: 5v, output current: 1A,

Fig.4: Voltage Regulator (LM 7805)

E. Flex Sensor

Flex sensor is a type of sensor that detects bending or flexing of its substrate. It’s typically a thin, flexible component that changes it a resistance or capacitance depending on the degree of bending. Monitors patient movement and position, enabling detection of discomfort or distress and facilitating personalized care and support. Resistance range: at flat surface 25k ohm at 90 degree 30-40k ohm.

Fig. 5: Flex Sensor

F. Temperature Sensor

A temperature sensor is a device or component that measures temperature and converts it into an electrical signal. Thermistors are temperature-sensitive resistors whose resistance changes significantly with temperature. Tracks patient body temperature, allowing early detection of fever or hypothermia and enabling proactive medical intervention to maintain optimal health. Temperature range: -40 degree Celsius to 125degree Celsius.

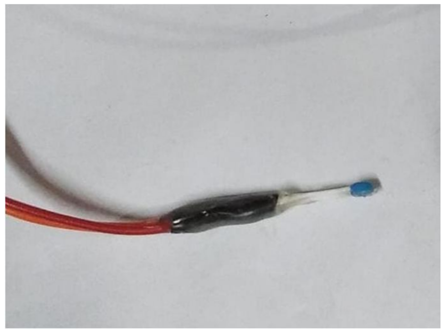


Fig.6: Temperature Sensor

G. Pulse Sensor

A pulse sensor is used to detect and measure heart rate or pulse rate. It typically works by optically sensing the blood flow through a person's skin, usually at a fingertip or earlobe, and converting this information into an electrical signal that can be processed and analysed. Continuously monitors patient heart rate, providing valuable insights into cardiovascular health and enabling timely intervention in case of irregularities or emergencies. Measurement range: 30 BPM to240 BPM.

Fig.7: Pulse Sensor

H. 8-Channel Voice Recorder:

An 8-channel playback voice recorder is capable of recording audio from multiple sources simultaneously and then playing back the recorded audio on eight separate channels or tracks**.** Records audio for communication between patients and caregivers, facilitating efficient information exchange and documentation of medical observations for comprehensive care management.

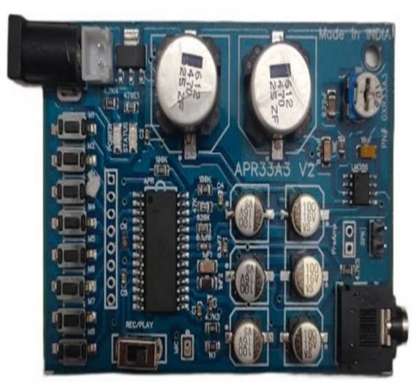


Fig.8: 8-Channel Voice Recorder

I. Switch

When the button is pressed, it makes or breaks the electrical connection within the switch, allowing current to flow or stopping it. Push switches are commonly used in various electronic devices and control panels, such as keyboards, calculators, remote controls, and industrial control system. They come in different shapes, sizes and configurations to suit different applications, including momentary or latching types, where the switch either returns to its original position after releasing the button (momentary) or stays in the pressed position until pressed again (latching).

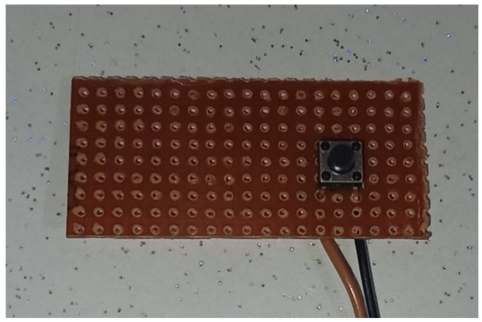


Fig.9: Switch

The system is composed of multiple modules designed to gather input and generate output as mentioned in below fig. 10, displayed on an LCD screen. It utilizes three flex sensors to discern gestures made by the patient. Each flex sensor corresponds to a specific message pre-recorded by an 8-channel voice recorder. These messages are not only showcased on the LCD but are also played through an APR33A3 module. Furthermore, the system (fig. 11) incorporates a pulse sensor and a temperature sensor for real-time monitoring of the patient's pulse rate and body temperature respectively. These vital signs are continuously showcased on the LCD screen. Additionally. Through Internet of Things (IoT) technology, caregivers and relatives can remotely monitor the patient's condition in real-time via their mobile phones. We have implemented a panic switch as a safety measure for situations where the patient may feel unconscious. In such instances, the patient can press the panic switch, which triggers the APR33A3 to emit a continuous sound signal indicating that the panic switch has been activated. This auditory cue persists until the Arduino Nano is manually reset, ensuring that the alert remains active until addressed.

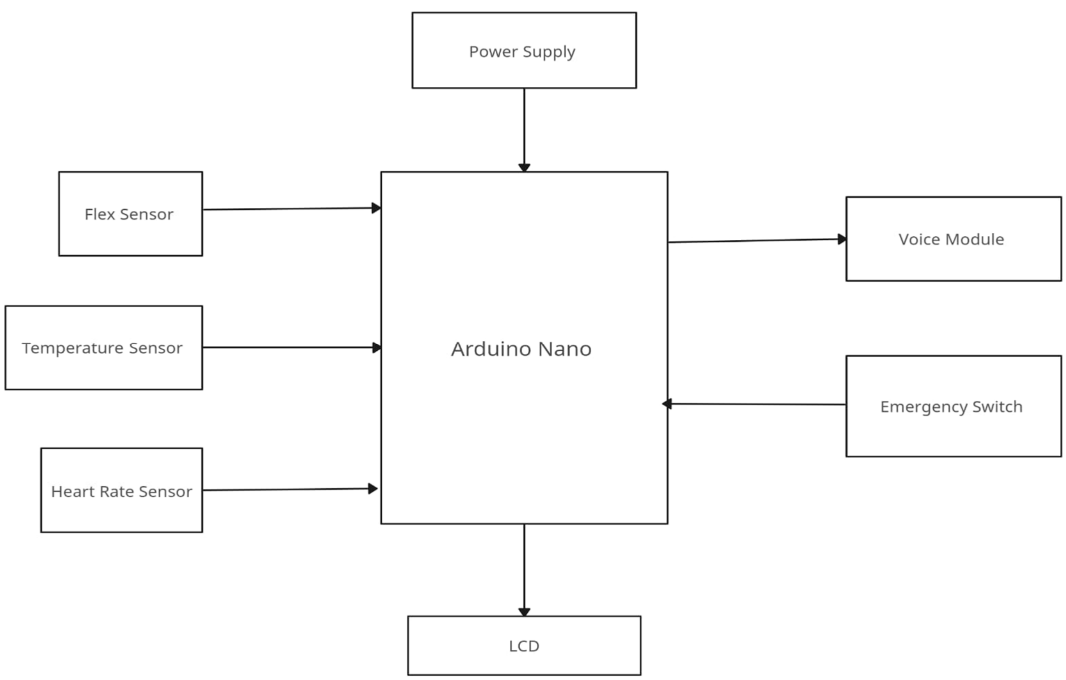


Fig.10: Schematic block diagram of smart system for providing services to bedridden patient.

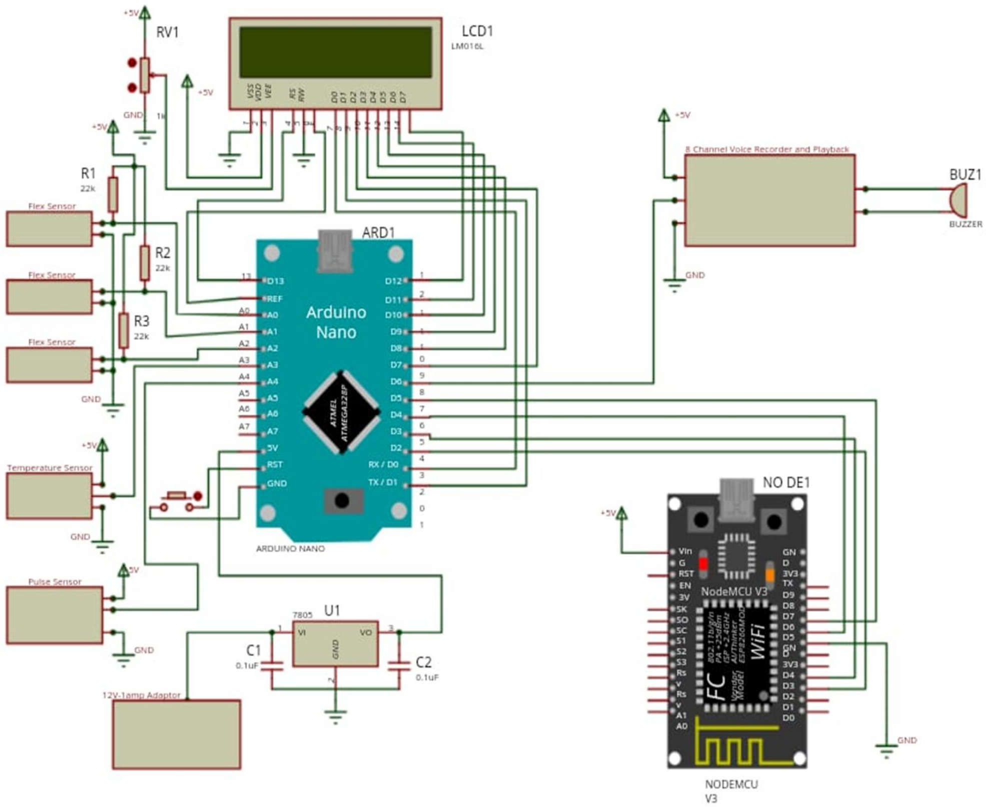


Fig.11: Schematic circuit diagram of smart system for providing services to bedridden patients.

IV. CONCLUSION

Based on the research we have carried out led to the development of smart gloves tailored for bedridden patients marking a significant stride in modern healthcare technology. These gloves offered a comprehensive solution for continuous patients monitoring and communication. The seamless integration of these components allowed for real-time tracking of vital signs, ensuring timely intervention when necessary. Gesture recognition capabilities enabled personalized interaction, enhancing patient comfort and autonomy. Furthermore, wireless connectivity facilitated by Node MCU modules enabled remote monitoring and data transmission, providing caregivers with access to crucial patient information regardless of their location. The inclusion of a voice recorder facilitated clear and effective communication between patients and caregivers, contributing to a more patient-centred care approach. Overall, smart gloves represented a promising avenue for improving the quality of life for bedridden patients, promoting their safety, well-being, and sense of dignity while alleviating the workload of caregivers. Continued research and development in this field hold the potential to further refine and enhance the capabilities of smart gloves, ultimately revolutionizing patient care in home and healthcare setting alike.

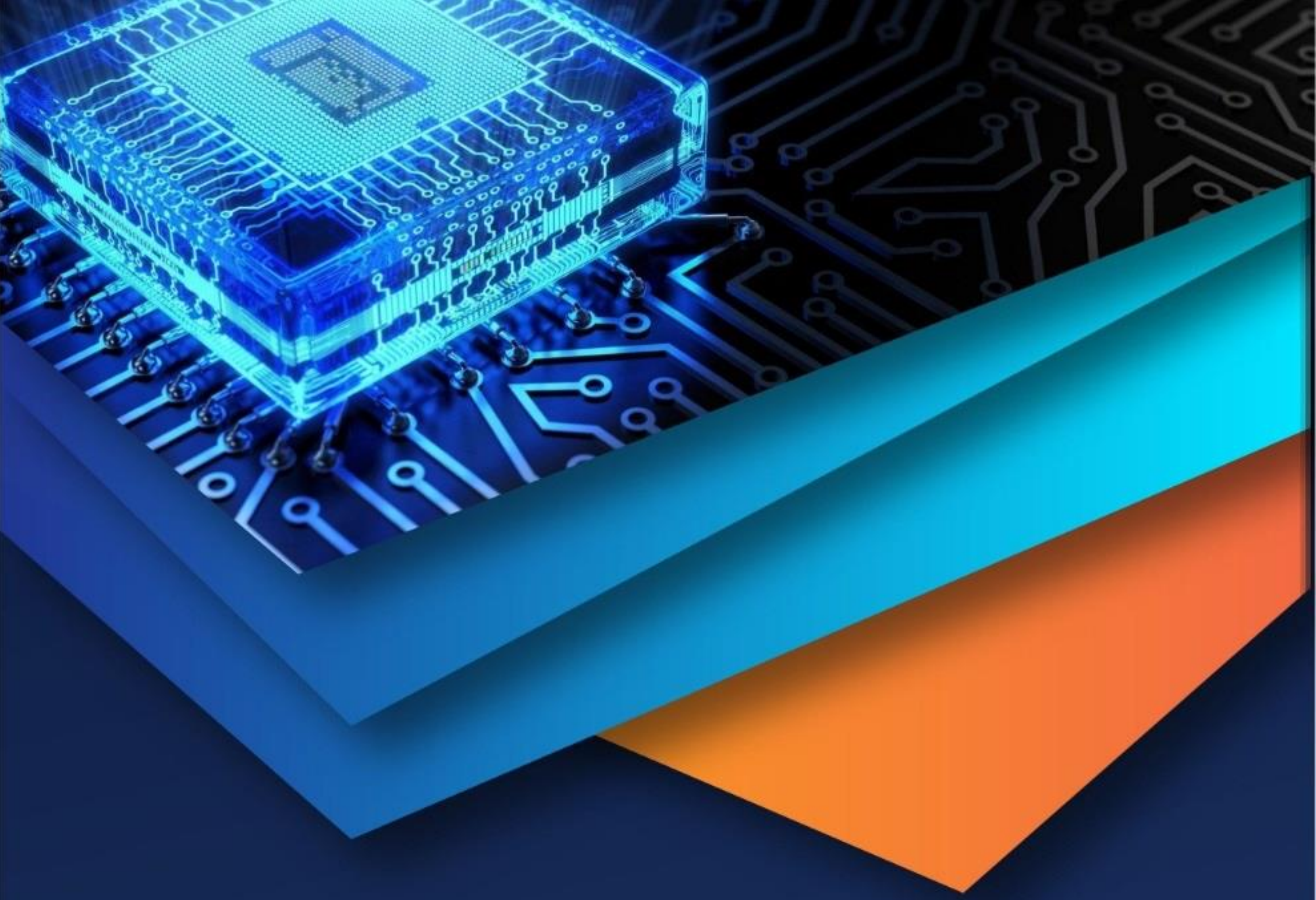
REFERENCES

[1] "Automated Paralysis Patient Health Care Monitoring System" published in the South Asian Journal of Engineering & Technology Vol. 3, No. 2(2017) 85-92.

[2] Patel, R., Gupta, S., & Kumar, A. "Integrating Flex Sensors and Arduino Nano for Gesture Recognition in Smart Gloves for Bedridden Patients." IEEE Sensors Journal, 21(8), 10579-10588.

[3] Lee, C., Kim, Dim., & Park, E. "Design and Implementation of a Wearable Smart Glove System Using Node MCU for Remote Monitoring of Bedridden Patients." Sensors, 21(4), 1234.

[4] Brown, M., & Clark, L.” Smart Glove with Temperature and Pulse sensor for Continuous Health Monitoring of Bedridden Patients.” International Journal of Medical Engineering and Informatics, 14(2), 123-135.
[5] .Garica, R., Fernandez, M., & Martinez, E. (Year). “Real-time Gesture Recognition in Smart Glove for Bedridden Patients using Arduino Nano and Flex Sensors.” IEEE Transactions on Neural Systems and Rehabilitation Engineering, 29(5), 1678-1687.
[6] Kim. H., Park, S., & Lee, S. (Year). “Development of a Smart Glove System with 8-channel Voice Recorder for Communication Assistance in Bedridden Patients.” Journal of Assistive Technologies, 12(4), 321-332.
[7] Rodriguez, A., Martinez, P., & Gonzalez, L. (Year). “Wireless Smart Glove System with Node MCU for Remote Monitoring of Bedridden Patients.” International Conference on Biomedical Electronics and Devices, 147-155.
[8] Nguyen, T., Q., & Phan, H. “Smart Glove Integration of Fleas and Temperature Sensors for Gesture Recognition and Health Monitoring in Bedridden Patients.” Biomedical Signal Processing and Control, 63, 102140.
[9] Hernandez, G., Lopez, M., & Perez, D., (2021). “Arduino Nano- based Smart Glove System for Real -time Gesture Recognition and Communication in Bedridden Patients.” IEEE Access, 9, 100654-100663.
[10] Wang, X., Li, Y., & Zhang, z. (2021). “Design And Development of Smart Glove for Bedridden Patients using LCD Display and Voltage Regulator.” Journal of Healthcare Engineering, 2021, 8967456.



10.22214/IJRASET

INDEX COPERNICUS
45.98

ISRA JIF
IMPACT FACTOR:
7.129

TOGETHER WE REACH THE GOAL
IMPACT FACTOR:
7.429

ISI

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY