# MED-ROBOT FOR PATIENT HEALTH MONITORING

Vikas Vippalapalli
*Electronics and Telematics,GNITS*
Hyderabad, India

Kongarapi Aasha Madhuri
*Electronics and Telematics,GNITS*
Hyderabad, India

Konda Sindhura
*Electronics and Telematics,GNITS*
Hyderabad, India

Pasham Lahari
*Electronics and Telematics,GNITS*
Hyderabad, India

Rachala Deekshitha Reddy
*Electronics and Telematics,GNITS*
Hyderabad, India

Reddygari Amruthavarshini
*Electronics and Telematics,GNITS*
Hyderabad, India

***Abstract* — This research describes an innovative Med-Robot that improves access to medical care by giving personalized diagnoses via conversational interactions. It can diagnose patients, measure critical factors including heart rate and temperature, and administer medications. This limits human-to-human contact, which is critical in limiting the spread of diseases such as Coronavirus and tuberculosis. The Med-Robot uses IoT technology and can be operated from a WIFI-enabled Android handset. The robotic vehicle, developed for practical demonstration, is equipped with two DC motors for mobility, and an Arduino microcontroller to process commands. Vital metrics are monitored by sensors on the vehicle, and data is relayed back to the user app over WIFI.**

***Keywords—Heart Rate monitoring , DHT sensor, H-Bridge , DC motors, WIFI enabled***

## I. INTRODUCTION

Med-Robot is an advanced robotic technology designed to deliver medicine and monitor patient parameters in healthcare settings. It merges delivery robot functions with sophisticated monitoring capabilities to enhance patient care, boost efficiency, and reduce human error in medical environments. Robotics is now prevalent in nearly all fields, including healthcare. In this sector, IoT-enabled robots are employed for surgeries, caregiving, mobility assistance, and pharmaceuticals. These robotic systems have greatly enhanced human abilities to sense, interact, manipulate, and alter our environment. Medical robotic devices are intended for various applications related to disease treatment and prevention.

Due to the severe COVID-19 pandemic, hospitals are experiencing overcrowding from a surge in new patients. This has created an urgent need for support among hospital staff. Robotic healthcare can play a crucial role by assisting with tasks while minimizing direct contact with COVID-19 positive patients. One of the key responsibilities of nurses is to care for their assigned patients, which includes administering medications at the right times and monitoring vital signs.

Every day, it would take around a half to an hour to provide medicine and monitor the patient's vitals (heart rate, pressure, temperature, and SpO2). To reduce medical personnel labor, medicine dispensing and parameter monitoring can be automated. Med robot is a strong AI-powered medical robotic technology designed to change healthcare delivery. It integrates robotics and artificial intelligence to assist healthcare personnel during surgeries, patient care, and administrative tasks in medical facilities. It is a cutting-edge AI-powered medical robotic device designed to augment and assist healthcare workers with a wide range of medical tasks and procedures. It combines advanced robotics and artificial intelligence to increase precision and efficiency.

## II. RELATED WORK

Med-Robots has seen significant growth, extending its reach into many areas, including healthcare, for surgeries ,patient care, mobility assistance and medication administration.

Steinkamp et al.'s study [1] provides a systematic scoping review of technological strategies aimed at improving medication adherence among adults with mental health and substance use disorders. The review was conducted following PRISMA guidelines and a published protocol (PROSPERO: CRD42018067902) identified 127 studies from seven databases covering the period from January 2000 to September 2018. The interventions studied incorporated a range of technologies, including mobile apps, electronic pill dispensers, and telehealth solutions, aimed at improving adherence or measuring it through tools like biosensors, ingestible sensors, and smart pill bottles.

The study outlines a transdiagnostic taxonomic framework for classifying these interventions, noting their multi-component nature, which complicates assessing the individual impact of each. Key intervention components included reminders, psychoeducation, remote care delivery, and social support, while adherence measurement methods varied from self-reports to advanced computer vision algorithms. The findings suggest that while many of these interventions show promise, further research is needed to assess long-term effectiveness, scalability, and ethical concerns such as privacy and patient autonomy in diverse patient populations.

Additionally, the study highlights the potential for adapting effective interventions across different psychiatric disorders, though customized approaches may still be necessary. It calls for more longitudinal studies to validate these findings and address challenges such as digital literacy and disparities in access to technology.

Raje et al.'s research [2] explores the critical role of healthcare robots in mitigating the spread of COVID-19 and enhancing clinical efficiency. The study, conducted through a systematic review following PRISMA guidelines, highlights the deployment of robots in various healthcare settings during the pandemic to minimize direct human interaction, a key factor in SARS-CoV-2 transmission. A total of 92 studies from 1998 to 2021 were included in the analysis, emphasizing robots' operational and technological applications in areas such as disinfection, cleaning, medication delivery, and remote patient monitoring.

The review identifies key types of robots used during the pandemic, such as disinfection robots like UVD-bots and iMap9, and hospitality robots like Sona 2.5 and Co-bot. These robots not only reduce human-to-human contact but also improve healthcare operations by automating routine tasks. Additionally, the use of telepresence and surgical robots, including the Da Vinci Surgical Systems, has enabled remote care and complex surgeries, reducing the risk of infection for healthcare personnel.

The authors note significant growth in the medical robot market during the pandemic, suggesting a growing reliance on robotic solutions. The research calls for future studies to focus on increasing the autonomy of robots, improving their adaptability across different healthcare environments, and addressing cost-effectiveness to ensure wider global adoption. As healthcare systems continue to adapt in the post-pandemic world, integrating robotics will be essential to bolster resilience and efficiency in future health crises.

## III. PROPOSED SOLUTION/METHODOLOGY

The proposed device Med-robot for patient health monitoring leverages advanced robotic system designed to monitor patient parameters in healthcare settings. It combines the capabilities of a delivery robot with sophisticated monitoring features, aiming to improve patient care, enhance efficiency, and reduce human error in medical facilities. This robot is capable of execute commands from an android device, transmitting sensed parameters via WIFI. Hardware components like Temperature sensor, DC motors, Heart beat sensor and a WIFI module are used.

The med-robot consists of two main components: a temperature sensor and a heartbeat sensor. The temperature sensor is positioned to continuously monitor the patient's body temperature, while the heartbeat sensor tracks the patient's heart rate. All sensor data is transmitted to the user via Wi-Fi.

Hardware Design: The heartbeat sensor operates on the principle of photoplethysmography , which detects changes in blood volume in any organ, leading to variations in light intensity as it passes through. The DHT sensor is calibrated to measure the patient's temperature.

Software Implementation: The data from the sensors is processed using an embedded microcontroller. Upon collecting the data from patient, it is sent to user via WIFI using serial WIFI terminal. It is a line-oriented terminal and console application designed for devices connected via WIFI

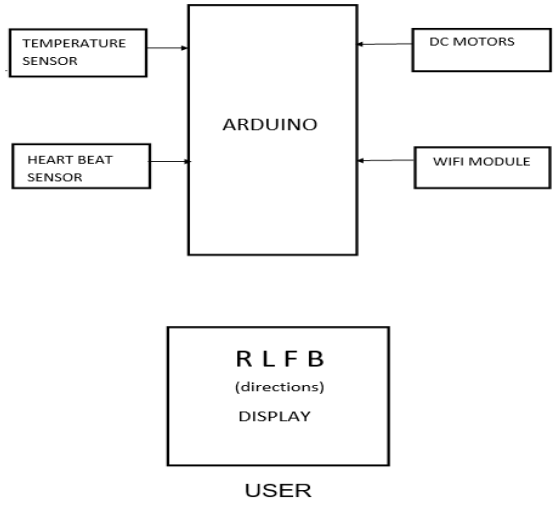


Fig.1.Block diagram of Med-robot

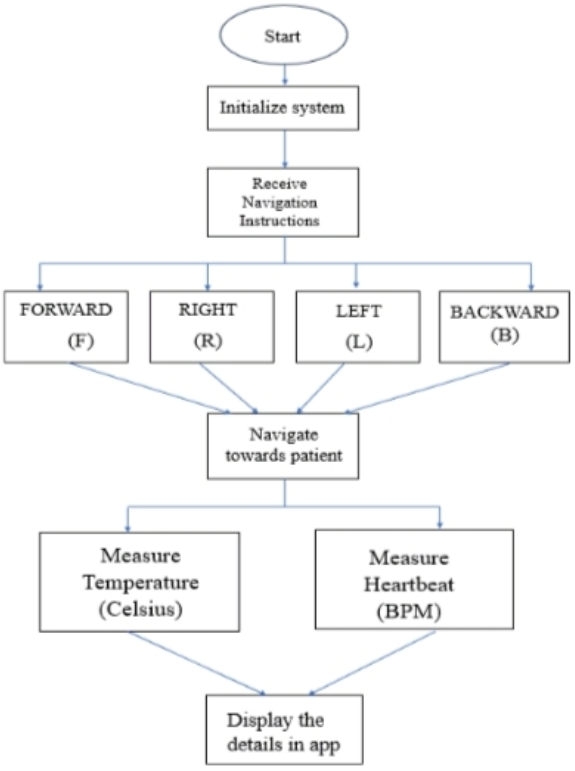


Fig.2. Flow chart for Med-Robot

This flowchart outlines the operation of a medical robot designed to navigate towards a patient and measure vital parameters. The process begins with the system initialization and receiving navigation instructions. The robot can move forward, backward, left, or right to approach the patient. Upon reaching the patient, it measures their temperature in Celsius and heartbeat in BPM (beats per minute). The collected data is then displayed in a serial WIFI terminal.

## IV. ISSUES AND RI SK S

In traditional patient health monitoring systems, sensors like the heartbeat and temperature sensors are used to track vital parameters, with the gathered data sent to a central device for analysis. Upon detecting any abnormalities in the collected data, the system alerts medical staff or caregivers based on the severity of the issue. Patient health monitoring research focuses on enhancing real-time detection of potential health concerns by recognizing irregularities in vital signs and alerting medical professionals before a critical event occurs.

With the advancement of IoT and mobile technologies, new opportunities have emerged to integrate continuous patient monitoring with communication systems, making health monitoring more efficient. Various sensor-based devices, both wearable and non-wearable, are available to detect and transmit vital data. These devices can also track patient locations and vital signs remotely, providing real-time information to healthcare professionals or family members. However, a disadvantage of wearable devices is the need for patients to wear them continuously, which may be impractical in certain scenarios. Other IoT-based solutions, such as stationary monitoring systems, offer continuous monitoring but may have limitations in predicting long-term health issues. Several methods for predicting and preventing health complications have been developed, and while full prevention remains complex, it is achievable through sustained monitoring and advanced analytics.

In traditional medicine delivery systems, healthcare professionals manually administer medications at specified times, increasing the potential for human error or delayed administration. With the rise of robotics and IoT, automated medicine delivery systems have been developed to ensure timely and accurate medication distribution. These robots are equipped with sensors and communication modules to track patient needs, delivering medication precisely when required, and alerting healthcare staff if there are any discrepancies or delays.

The integration of IoT technology into these robots offers enhanced tracking and coordination with hospital management systems, ensuring that medication schedules are followed accurately. Wearable and non-wearable devices can also monitor patient reactions to the medications, providing real-time data to healthcare professionals for timely interventions. However, one challenge with robotic medication systems is the need for continuous monitoring and regular maintenance to avoid malfunctions. Additionally, while these systems can improve efficiency, they may be limited in environments with high patient volume or complex medication regimens. The development of more advanced AI-driven systems could help overcome these limitations, providing both predictive and preventive solutions for medication management.

## V. ROLE OF IOT IN HEALTHCARE

The robots are changing the face of healthcare by providing innovative solutions that enhance the quality of care, leaving the medical processes streamlined. Maybe most importantly, however, one of the most significant functions of robots in healthcare is to assist surgeons in carrying out extremely precise and minimally invasive surgeries. Using surgical robots, such as the da Vinci Surgical System, the surgeon can be very precise and dexterous, thus reducing the times taken for patients to recover as well as complications resulting from surgery. That's why developments in robotics contribute to hospitals providing safer and more effective treatments for diseases.

Also, apart from surgery, robots may be applied in patient care and rehabilitation. Robots can assist physically handicapped or elderly patients regain physical mobility and autonomy by using physical therapy exercises. For instance, exoskeletons can assist the persons to walk again. In so doing, they contribute to the betterment of the movement of the patient but also to the strengthening of muscles as well. Robotic nurses can also assume a number of routine tasks, such as dispensing drugs, taking vital signs, or delivering supplies, in hospitals so human nurses can be trained to perform more complex tasks on patients.

Robots are increasingly contributing to infection control, which has gained importance in the face of pandemics such as COVID-19. Ultraviolet (UV) or chemical-based disinfection robots quickly sanitize rooms, surgical theaters, and equipment so infections spread less in hospitals. They can easily move into areas that are otherwise difficult to reach and operate independently, thus being a trusted and effective means for maintaining the hygiene of a hospital. In addition, healthcare robotic systems are combined with artificial intelligence in diagnosing and monitoring patients.

Using artificial intelligence, medic robots can analyze medical data and help a doctor discover disease well before it starts and can do so very accurately. Robots, such

as Med-Robot, can even monitor patient vital signs, including heart rate, blood pressure, and temperature, and report such real-time health data to a doctor, minimizing the contagious spread of diseases among healthcare workers. The integration of robotics with AI technology is showing fruitful results in terms of personalized patient care and is helping to make a better global outcome related to health care.

## CONCLUSION

The use of the Med-robot for patient health monitoring represents a significant leap in advanced robotic systems. The device successfully monitors the patient's temperature and heart rate using a DHT sensor and a Heartbeat sensor. This technology lowers healthcare expenditures and improves access to medical services by delivering personalized diagnoses via conversational interactions.

This new technology can not only diagnose patients, but also measure crucial indicators like heart rate and temperature and administer medications. This limits human-to-human interaction, which is critical in limiting the transmission of devices like as coronavirus and tuberculosis.

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