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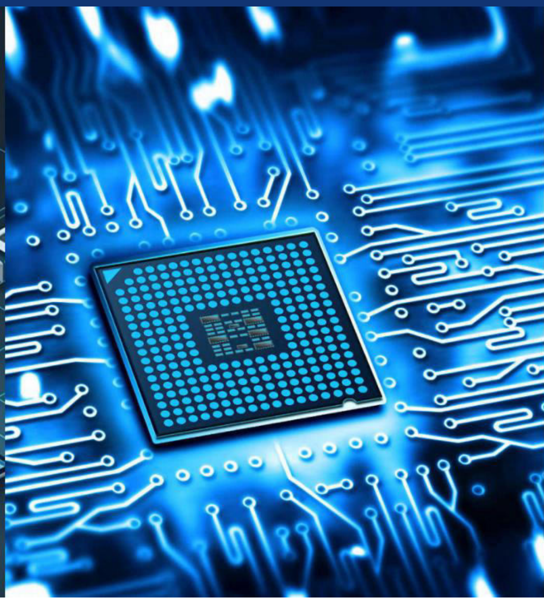

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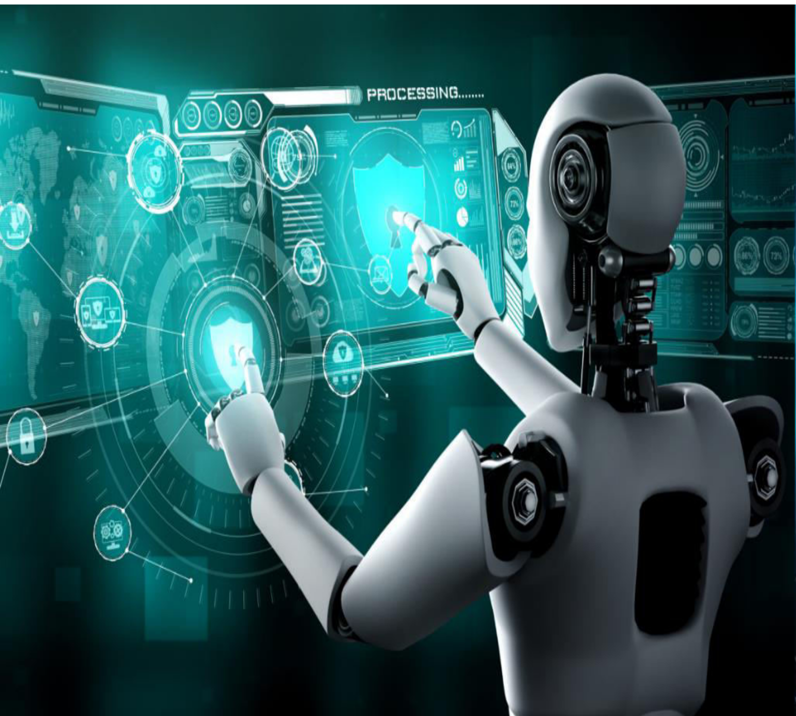

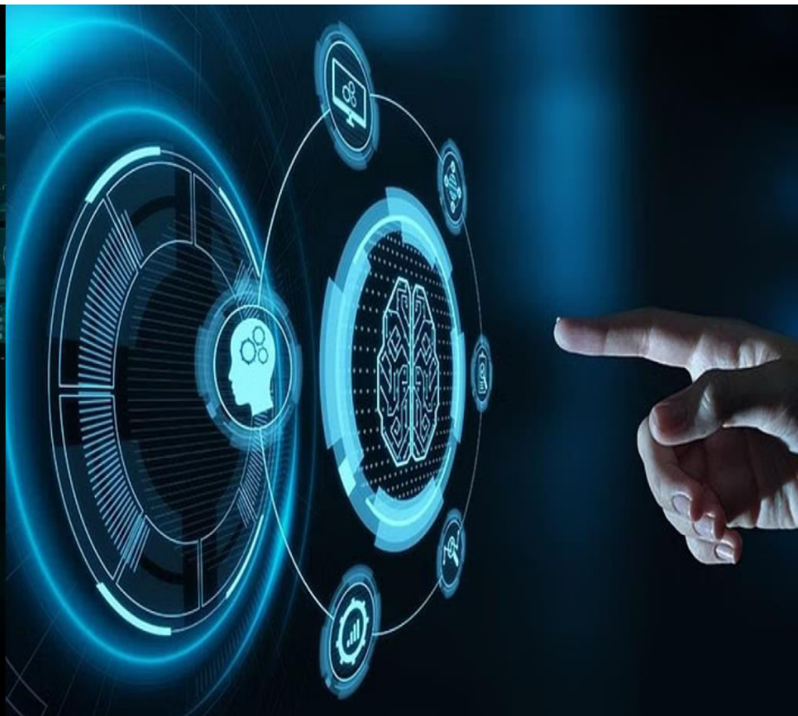

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MEDIVOX -Wireless Patient Health Monitoring

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ABSTRACT: Advances in the Internet of Things (IoT) have revolutionised real-time health monitoring by allowing continuous collection and analysis of patient data. The study presents a smart health monitoring system integrating sensors enabled by the Internet of Things to measure key physiological parameters such as body temperature, respiration (SPO) and pulse rate. The system uses temperature sensors and SPO_2 sensors, connected to a microcontroller, the Arduino, to capture and process vital health data. Collected data was transmitted wirelessly to a cloud platform, which allowed remote monitoring by health professionals. This approach improves patient care by providing real-time alerts in case of abnormal data, allowing for early intervention. The proposed system is cost-effective, compact and suitable for remote patient monitoring, emergency medical care and personal health monitoring.

KEYWORDS: IoT, Smart health system, Arduino microcontroller, SpO_2 sensor, Cloud-based healthcare, Remote patient monitoring

I. INTRODUCTION

In the medical and pharmaceutical industries, embedded systems, which combine hardware and software, are essential to enable real-time monitoring, diagnosis and treatment. These systems, when combined with the Internet of Things and smart sensors, offer continuous health assessments, improve patient care and reduce hospital visits. They are commonly found in wearables such as fitness trackers, glucose monitors and pacemakers. Continuous glucose monitors help diabetic patients monitor their blood sugar without painful needle sticks, while smart fitness trackers track your heart rate, activity levels and sleep patterns, and promote healthier lifestyles. In a hospital setting, smart beds with embedded sensors monitor patient movements and adjust their positions to suit their comfort, and non-invasive clinical monitoring devices wirelessly transmit vital signs such as temperature, pulse rate and oxygen saturation to the doctor, ensuring the care of patients in real time. Remote patient monitoring devices enable doctors to monitor the health of chronic patients remotely, facilitating early diagnosis and reducing healthcare costs. Advanced prosthetic limbs with embedded sensors that interact with neural signals to allow for natural movement of the limbs are being developed. Emerging technologies such as microbots for surgery and smart tattoos for biometric tracking show the future potential of embedded systems in the health care sector. The increasing burden of chronic diseases and limited access to timely healthcare, especially in remote areas, highlights the need for affordable solutions for health monitoring. Embedded systems bridge the gap between patients and healthcare providers by offering cost-effective, continuous monitoring, proactive care, early diagnosis and improved health outcomes. By integrating the Internet of Things with biomedical sensors, these systems empower individuals to take control of their health, reduce hospital dependence and promote social justice by making quality health care affordable for all.

II. RELATED WORKS

Robots in medical services have developed considerably, improving health care in areas such as patient monitoring, care of the elderly and disease prediction. Represents by the Chinese. Reputation of the mandate by the Commission. While Peleka et al.[2] focused on the monitoring of medical robots, [3] Developed a service robot for patients with multiple sclerosis. Carranza et al. introduced telepresence robots for remote consultation. Hong et al. (2011) on the feasibility of disease prediction, entitled misconception of valuable properties[4]. While Zaccaria et al.[5] proposed an algorithm based on artificial intelligence, [6] examined robotic systems for logistics. Remote-monitoring studies by Malasinghe et al. Refusal of the contribution of the subsidiary liability. [8] stressed the Internet of Things and the transfer of skills in medical robots. Islam and the world. Smart health systems and Hadi et al.[9] contributed to the differentiation of smart health systems. [10] designed a robot for the COVEND- 19 patient bed.Wu et al. explored robotics in rehabilitation and assistance. [11] for the humanoid robots and Song et al. [12] for medical assistants. Renowned by the name of Mr. [13] reviewed medical robotics from COVID-19, and Turnip et al. contributed to the

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revision of the [14] Integrated LIDAR for robots in patient care. Artificial intelligence-driven medical education robots were demonstrated by Chen et al. [15] Whereas, according to Ma et al. [16] Advanced Robotic Positioning Systems. Surrogate robots for surgery have been developed by Wang et al. Remarkable.[17] and Xia et al. [18] designed a smart service robot using the Raspberry Pi and STM32.

III. METHODOLOGY

The proposed system is a smart, Internet of Things-enabled health monitoring solution that monitors vital health parameters such as body temperature, pulse rate and oxygen saturation (SPO). An Internet of Things (IoT)-enabled health monitoring device that continuously measures key health indicators such as body temperature, heart rate and blood oxygen levels. It uses the Arduino microcontroller as its core, and includes temperature and SPO_2 sensors to collect physiological data in real time. This information is then transmitted wirelessly to a cloud platform or a smartphone application, allowing remote access for healthcare professionals, caregivers and patients. The system will issue warnings immediately when abnormal readings are detected, which will facilitate a prompt medical response and minimise health risks.

Compact, cost-effective and energy efficient, this system is ideal for remote patient care, telemedicine and home monitoring. It improves accessibility to healthcare, reduces hospital stays and encourages active health management, especially for people living in remote or under-served areas, by offering continuous monitoring and real-time data assessment.

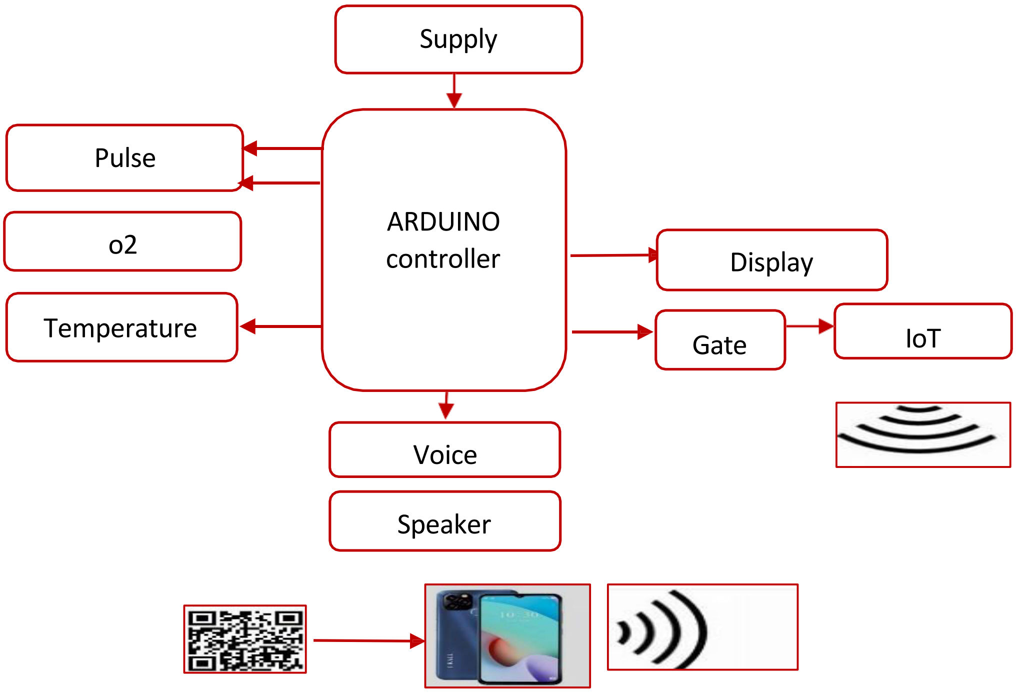

Figure 1. Block diagram of Proposed system

System Modules

1. Sensor Module: The device incorporates temperature and SpO_2 sensors that provide ongoing measurements of body temperature, heart rate, and blood oxygen levels. These sensors are connected directly to the Arduino microcontroller, enabling precise and instantaneous health monitoring.
2. Processing Module: The Arduino microcontroller handles the initial data collected from the sensors, employing

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filtering methods to eliminate noise and ensure precision before sending it for further examination or storage.

3. Communication Module: This Module enables the wireless transmission of data through Wi-Fi or Bluetooth, allowing for real-time access to health information via a cloud platform or mobile app. This feature ensures that users and health care providers can monitor health data effortlessly.
4. Alert Module: When unusual health metrics are detected, this module sends immediate alerts through mobile notifications, SMS, or email. This functionality allows for prompt medical action, reducing health risks.
5. User Interface Module: A mobile or web-based dashboard allows users to track their vital signs, view historical trends, and receive health recommendations. This interactive platform ensures easy access to personal health data and promotes proactive health care management.

IV. EXPERIMENTAL RESULTS

The hardware interfacing module is implemented using ESP8266, which is a wireless-based health monitoring system to sense heart rate, body temperature and Blood pressure. The sensed information is sent to the cloud wirelessly. The hardware module helps in real-time health monitoring systems at home gives the information and provides quick service if needed.

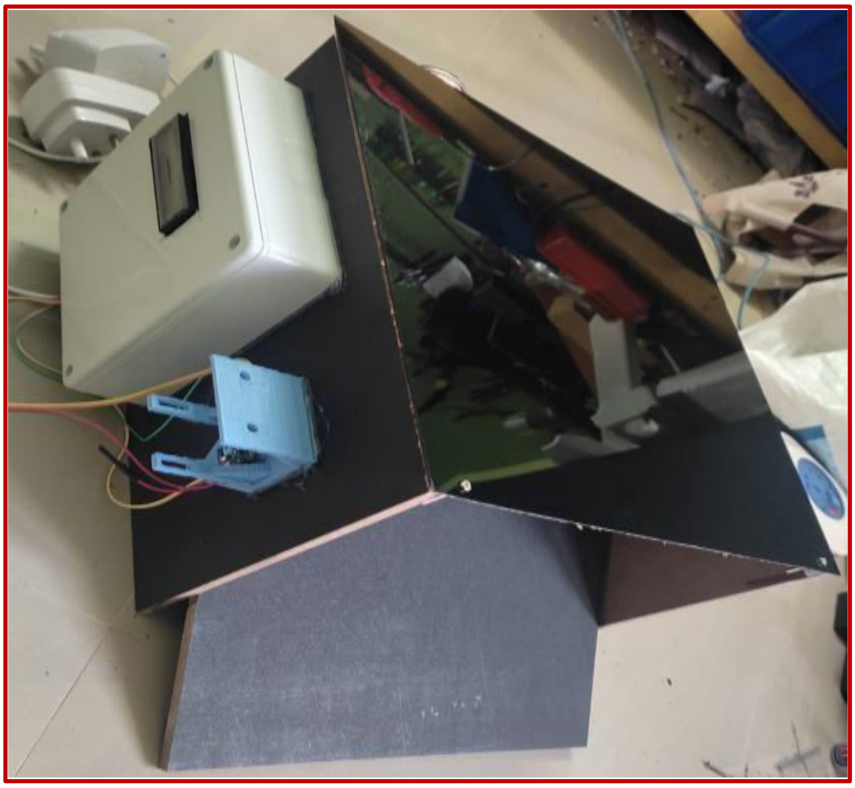

Figure 2. Prototype of Patient Health monitoring system

As depicted in Figure 3, the system accurately tracked temperature, SPO2 levels, and blood pressure in real-time. The values obtained were compared with standard report, revealing a high degree of correlation and affirming the system's dependability. The analysis of parameter variations was conducted effectively, facilitating prompt interventions for managing patient health.

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Figure 3. Patient health parameters output

Figure 3 presents a combination of four separate charts, each illustrating data gathered for health monitoring and displayed using the free software ThingSpeak application. Each chart shows a distinct health parameter over time period on March 3rd, with data points logged at 03:00 p.m and 12:00 a.m .

V. CONCLUSION

The IoT-based health monitoring system effectively monitors vital signs such as body temperature, heart rate, and SpO_2 in real-time with high precision and low latency. It facilitates uninterrupted remote monitoring through Wi- Fi and sends immediate alerts for any irregular readings, allowing for prompt medical response. Its affordable and compact design makes it suitable for remote patient monitoring and emergency healthcare situations. Although there are challenges like reliance on network connectivity and sensor calibration, future enhancements could incorporate AI-driven diagnostics, improved data security, and broader sensor capabilities to enhance healthcare accessibility and efficiency, minimizing hospital visits while enhancing continuous health monitoring.

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