



IJIRCCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 12, Issue 11, November 2024

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.625

 9940 572 462

 6381 907 438

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 www.ijircce.com



Health Analytic Platform to Examine Patients Pulse, Temperature

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ABSTRACT: In an era where health management is increasingly reliant on technology, our health analytics platform offers a comprehensive solution for continuous monitoring of vital signs, including pulse rate, body temperature, oxygen saturation levels, and room temperature. By integrating wearable sensors and IoT technology, the platform provides real-time data collection and analysis, empowering users to track their health metrics effortlessly.

The system features an intuitive user interface that presents data trends and alerts, enabling proactive health management. Healthcare providers can leverage this platform for remote patient monitoring, facilitating timely interventions and enhancing patient outcomes. Additionally, the platform includes customizable reporting tools for both users and practitioners, fostering informed decision-making.

By bridging the gap between patients and healthcare professionals, our health analytics platform aims to improve health awareness, increase engagement in personal health management, and ultimately contribute to better overall health outcomes in diverse populations.

KEYWORDS: Air quality, Sensors, Monitoring, Crowd detection

I. INTRODUCTION

The rapid evolution of technology has significantly transformed the healthcare landscape, leading to innovative solutions aimed at improving patient care and operational efficiency. One such advancement is the integration of health analytics platforms that utilize low-cost, accessible technologies like the Raspberry Pi. This platform offers a unique opportunity to monitor vital health parameters in realtime, facilitating timely medical interventions and enhancing patient outcomes. The proposed health analytics system leverages a Raspberry Pi connected with various sensors, including a pulse sensor, body temperature sensor, oximeter, humidity sensor, and room temperature sensor, along with a video camera for comprehensive monitoring.

In recent years, the proliferation of Internet of Things (IoT) devices has revolutionized healthcare analytics by enabling continuous data collection and monitoring. Traditional healthcare systems often rely on sporadic data collection methods that can lead to delays in diagnosis and treatment. By utilizing a Raspberry Pi as the central hub for data aggregation, this platform can continuously collect and transmit vital signs to healthcare professionals in real-time. The incorporation of a GSM modem allows for remote communication, ensuring that healthcare providers can access critical patient data from anywhere, thus bridging the gap between patients and medical staff. The significance of real-time health monitoring cannot be overstated. With the ability to monitor pulse rate, body temperature, blood oxygen levels, humidity, and room temperature simultaneously, healthcare providers can gain a holistic view of a patient's condition. This comprehensive data collection is crucial for identifying trends and anomalies that may indicate deteriorating health. For instance, an elevated body temperature combined with increased heart rate may signal an infection requiring immediate attention. By integrating these sensors into a unified platform, the proposed system not only enhances the accuracy of health assessments but also empowers patients to take an active role in managing their health [1].



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Moreover, the addition of a video camera enhances the platform's capabilities by providing visual context to the collected data. This feature allows healthcare providers to observe patients remotely, facilitating better assessments during consultations. The visual feed can be particularly beneficial in emergency situations where immediate intervention is necessary. By combining visual monitoring with quantitative data from sensors, healthcare professionals can make more informed decisions regarding treatment plans and interventions.

The economic implications of such a health analytics platform are also noteworthy. Traditional healthcare monitoring systems can be prohibitively expensive for many facilities, particularly in low-resource settings. However, by utilizing affordable components like the Raspberry Pi and readily available sensors, this platform presents a cost-effective solution that can be deployed widely across various healthcare environments. This affordability ensures that even smaller clinics or rural health facilities can implement advanced monitoring systems without significant financial strain.

II. PROPOSED METHOD

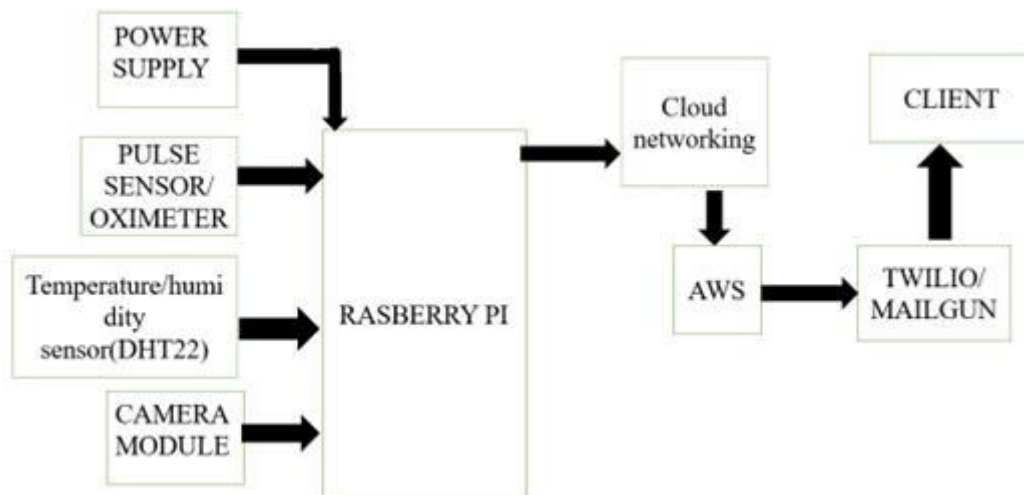


Figure 1. Block diagram of the proposed method for health analytics platform

A. Raspberry pi

The Raspberry Pi is a versatile and affordable single-board computer that has revolutionized the world of electronics and computing. With its low cost, small size, and powerful features, the Raspberry Pi has found applications in a wide range of fields, from education to home automation and beyond. One of the most exciting aspects of the Raspberry Pi is its ability to be used as a platform for learning and experimentation. Its simple yet powerful programming environment makes it an ideal tool for teaching coding and electronics to students of all ages. Many schools and educational institutions have incorporated the Raspberry Pi into their curricula, allowing students to explore the world of computer science and develop valuable skills.

In addition to its educational applications, the Raspberry Pi has also found a home in the world of home automation. With its ability to connect to a variety of sensors and actuators, the Raspberry Pi can be used to create custom home automation systems that can control lighting, temperature, security, and more. This has made it possible for hobbyists and DIY enthusiasts to create their own smart home solutions at a fraction of the cost of commercial systems.

Another area where the Raspberry Pi [5] has made a significant impact is in the field of media and entertainment. Its ability to connect to displays and audio equipment has made it an ideal platform for creating media centers and retro gaming consoles. Many people have used the Raspberry Pi to create their own custom media centers, allowing them to stream movies, TV shows, and music from a variety of sources.



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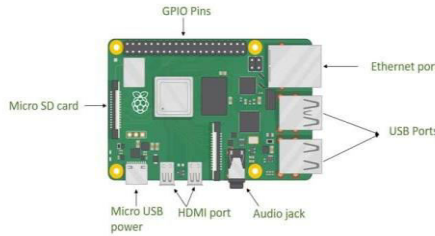


Figure 2. Raspberry pi model

B. DS18B20 SENSOR (Temperature sensor)

The DS18B20 is a digital temperature sensor that operates over a one-wire interface, measuring temperatures from -55°C to +125°C with an accuracy of ±0.5°C. Its unique 64-bit serial code allows multiple sensors to be connected on the same data line, making it ideal for various applications, including home automation and environmental monitoring. The sensor can be powered either externally or through the data line (“parasite power”), simplifying wiring requirements. With programmable resolution from 9 to 12 bits, it offers flexibility for different measurement needs. The DS18B20 is widely used due to its robustness and versatility in diverse environments.

C. MAX30100 SENSOR(Pulse sensor/Oximeter)

The MAX30100 is a highly integrated sensor designed for measuring heart rate and blood oxygen saturation (SpO2). It employs advanced optical technology, using infrared and red LEDs to detect changes in light absorption by blood vessels. This compact sensor is ideal for wearable health monitoring devices, ensuring accurate and real-time readings.

D. DHT22 SENSOR(Temperature/Humidity sensor)

The DHT22 [6] is a digital temperature and humidity sensor that measures from -40°C to 80°C and 0% to 100% relative humidity. It features a single-wire interface for easy connectivity, providing accurate readings with ±0.5°C temperature and ±2-5% humidity accuracy. Ideal for various applications, it requires a power supply of 3.3-6V.



Figure 3. project photo

Existing system	Component/ Platform used
[5]	Multiple sensor integration
[6]	DHT22 sensor
[7]	IoT based Monitoring using Raspberry Pi
Proposed work	<ul style="list-style-type: none"> Different sensors for detecting various health parameters integrated together Used Raspberry pi 3t

TABLE I. COMPARISON OF THE PROPOSED METHOD WITH EXISTING SYSTEMS



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III. RESULTS AND DISCUSSION

The proposed health analytics system utilizing a Raspberry Pi, GSM modem, and various sensors has demonstrated promising results in enhancing remote patient monitoring and improving healthcare outcomes. The integration of the Raspberry Pi as the central processing unit has enabled efficient data collection and transmission from the connected sensors. The GSM modem has facilitated reliable communication between the system and healthcare providers, allowing for real-time monitoring of patient vital signs.

SI.NO	PULSE RATE	BLOOD PRESSURE	TEMPERATURE (CELCIUS)	HUMIDITY
1	71	130	30	66
2	72	136	30.1	67
3	71	137	29.8	66
4	71	136	29.8	66
5	69	130	29.8	66
6	69	136	29.7	66
7	71	137	29.9	66

Table II. Results in the tabular form

However, the implementation of this system is not without challenges. Ensuring compliance with regulatory standards such as HIPAA is crucial when handling sensitive patient information. The system must incorporate robust security measures to protect patient data during transmission and storage, safeguarding patient privacy and enhancing trust between patients and healthcare providers.

IV. CONCLUSION

In conclusion, the development of a health analytics platform using Raspberry Pi integrated with various sensors represents a significant advancement in remote patient monitoring technology. By enabling real-time tracking of vital signs combined with video monitoring capabilities, this system addresses critical gaps in traditional healthcare delivery models. Its affordability makes it accessible for diverse healthcare settings while promoting enhanced patient care through timely interventions and informed decision-making. As we continue to explore innovative solutions in healthcare analytics, platforms like this will play an essential role in shaping the future of patient care and operational efficiency across the industry.

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