AI Based Human Health Remote Supervision with Wireless Sensors

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***Abstract*— Healthcare technology has significantly advanced, leading to extended lifespans for many individuals. However, individuals residing in rural areas continue to encounter challenges in various aspects accessing professional healthcare services due to geographical barriers and shortages of medical personnel. This paper proposes An Internet of Things (IoT)-enabled system for real-time remote monitoring of patients aimed at overcoming these challenges. By utilizing sensors such as Heart Rate, Temperature, Sweat, and Spo2 sensors, the system collects vital patient data which is then transmitted to the cloud for analysis. Anaconda software is employed for data processing, ensuring the integrity and accuracy of real-time patient information. Through the implementation of this system, rural communities can derive advantages from improved access to healthcare services and timely intervention, ultimately enhancing overall health outcomes.**

Keywords—Healthcare technology, rural healthcare, Internet of Things (IoT), remote patient monitoring, sensors, Heart Rate, Temperature, Sweat, Spo2, real-time, cloud, Anaconda software, data processing, access to healthcare, timely intervention, health outcomes.

I. INTRODUCTION

With the rapid increase in healthcare problems such as coronary heart diseases, obesity, and lung failures resulting in a death rate of 7.2 million people in every year, there is an urgent need to address these challenges effectively. In today's busy lifestyle, continuous checking of patients' vital parameters like temperature and heart rate has become cumbersome. This project has a methodology for remotely monitoring patients using IoT and embedded technology to alleviate the burden on healthcare professionals.

A remote patient monitoring system has emerged as a viable solution for addressing gaps in healthcare services, particularly in rural areas, leveraging Information and Communication Technologies (ICT).This system enables doctors to remotely observe patients' health conditions anytime, anywhere, facilitating early detection and preventive measures for disorders.

Medical electronics sensors (E-sensors) play a pivotal role in patient monitoring, representing a significant advancement in research. Utilizing sensors such as temperature and heartbeat sensors, this proposed model allows for real-time monitoring of patients' body temperature and heart rate, akin to use a thermometer at home for initial health assessment.

In light of current challenges, including the pandemic and financial constraints, accessing In response to the growing challenges in healthcare services, we present the concept of an innovative Arduino microcontroller-based integrated health monitoring system, known as the Virtual Telemedicine System for Remote Health Monitoring with Machine Learning capabilities.

By combining IoT, embedded technology, and machine learning, this system offers a comprehensive solution for remote health monitoring, enabling individuals to assess their health status at home, thus reducing the need for frequent doctor consultations and diagnostic center visits. This innovative project hold promise in enhancing healthcare accessibility, particularly in underserved regions, and improving overall health outcomes.

II. RELATED WORK

1--Android An application has been developed to expand the range of health monitoring devices and enable real-time tracking of patients.P. Szakacs-Simon; S. A. Moraru; L. Perniu
Publications: IEEE 9th International Conference on Computational Cybernetics (ICCC). The main scope

is to monitor people at risk in real time even if they are outside of their home and wireless home gateway is out of range.

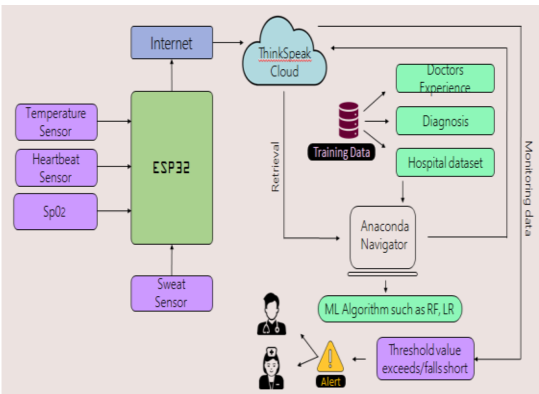
2-- An Android-based healthcare monitoring system has been developed by Maradugu Anil Kumar and Y. Ravi Sekhar. Presented in the International Conference on Innovations in Information, Embedded, and Communication Systems (ICIIECS), this healthcare scheme concentrates on measuring and monitoring various biological parameters of the patient's body, including heart rate, blood oxygen saturation level, and temperature. This is achieved through the integration of a web server and an Android application.

3-- Won-Jae Yi, Weidi Jia, and Jafar Saniie have introduced a mobile sensor data collector utilizing an Android smartphone in their publication at the IEEE 55th International Midwest Symposium on Circuits and Systems (MWSCAS). Their system not only collects sensor data but also displays it on the smartphone screen and streams it to a central server concurrently. The data transmission among devices is facilitated through Bluetooth and wireless Internet connections.

III. OBJECTIVES

1--To design virtual remote health monitoring system
2--To process data collected from patient through various sensors like temperature, heartbeat, sweat, oxygen levels etc.
3--To store the values in cloud for further accessing.
4--To make use of IOT platform and cloud handling data , with ML for display and analysis.
5--Faster response can be done by using this technique.

IV. METHODOLGY



Hardware Requirements

- Esp32
- Heartbeat sensor
- Temperature sensor
- Spo2 sensor
- Sweat sensor
- LAPTOP

Software Requirements

- Arduino IDE
- Embedded C
- Anaconda Jupyter Notebook

- The Virtual Telemedicine System is depicted through a block diagram, illustrating the integration of various sensor devices including temperature, heartbeat, spo2, and sweat sensors.
- These sensor devices are consolidated into a wristband worn by the patient, facilitating continuous monitoring of vital body parameters.
- The ESP32 microcontroller, renowned for its capabilities in IoT applications with built-in Bluetooth and Wi-Fi functionalities, is utilized and programmed through the Arduino IDE.
- Data collected from the sensor networks is processed by the ESP32 microcontroller for analysis.
- ThingSpeak cloud, a web service, is employed for displaying and accessing data online, enabling remote monitoring from any location.
- Analyzed data is transmitted over the internet and stored in the cloud for access by healthcare professionals.
- Utilizing ThingSpeak server, data monitoring over the internet is facilitated using APIs and channels provided by the platform.
- Patient medical history is securely stored in the cloud, allowing retrieval of processed data for treatment purposes.
- Machine learning principles are incorporated, enabling the system to learn from experiences and examples without explicit programming.
- Python, a versatile and easy-to-understand language, is utilized for doing various machine learning tasks due to its extensive capabilities.
- Linear Regression and Decision Tree algorithms are employed for training and updating data to enhance predictive accuracy.
- Training data, encompassing various formats such as text, images, video, or audio, is utilized to train machine learning algorithms effectively.
- Machine learning algorithms trained with sensor

parameters are employed to continuously analyze the patient's health condition, with the updated data being sent to the cloud.

- Threshold ranges for parameters such as heartbeat, temperature, and oxygen levels are established to monitor the patient's current status.
- In case of deviations from standard parameter ranges, alerts and notifications are generated and sent to the patient's family and healthcare providers.
- Analyzed data and treatments provided by doctors are stored in cloud, enabling retrieval for historical reference and further treatment planning.

Technical details about the Existing project

- The existing system requires many separate components to be carried by an individual to measure their own pulse rate ,blood pressure, temperature and so on.
- It restricts doctors assigned to every individual patient to be present in patients all the time.
- It needs more staff members to operate and which in turn increases the probability of being infected.
- It doesn’t provide the complete historical data to analyze and do the prediction of the recovery rate

INNOVATIVENESS & USEFULNESS

- The system is more accurate when compared to other systems.
- The system is more Efficient , Reliable and Cost Effective.
- It saves time.
- The reliance on manual operation has been significantly minimized.
- Less manpower required.

V. ADVANTAGES

- The virtual telemedicine system is more accurate when compared to other systems since it is a real time monitoring.
- System is more efficient, reliable.
- System is useful for the patients residing in inaccessible areas or isolated regions.
- The virtual system has reduced manual operation to a major extent as sensors are always connected and continuous monitoring is enabled.
- When compared to conventional ways of healthcare administration, telemedicine is a more cost-effective approach. This is valid since doctors and patients do not need to travel each time; they need to see a doctor or patient and also saves time.

VI. CONCLUSION

The Virtual Telemedicine System offers low complexity, minimal power consumption, and high portability for monitoring patients remotely, potentially negating the necessity for costly facilities. This study proposes a real-time health monitoring system for patients in remote areas. The system comprises wearable sensors and a cloud platform employing machine learning algorithms. It is adaptable and capable of extracting various parameters such as heart rate, oxygen levels, and temperature of patients. The gathered data is transmitted to the cloud via Bluetooth for further analysis. Machine learning algorithms continuously monitor the patient's status, and an alarm system, based on predefined threshold values, alerts both the doctor and family members in case of abnormalities.

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