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A Review on Health Monitoring System

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Abstract: Advancements in wearable sensor technology have paved the way for innovative health monitoring systems capable of assessing multiple vital signs simultaneously. We introduce a comprehensive Health Monitoring System (HMS) integrating a pulse sensor, electrocardiogram (ECG) sensor, and pulse oximetry (SpO2) sensor to provide a comprehensive assessment of an individual's health status. The pulse sensor enables continuous measurement of heart rate and pulse waveform characteristics, providing insights into cardiovascular health. The ECG sensor records the electrical activity of the heart, allowing for the detection of abnormalities such as arrhythmias and myocardial ischemia. The SpO2 sensor measures blood oxygen saturation levels, providing crucial information about respiratory function and potential hypoxemia. The system allows healthcare professionals to remotely monitor patients' vital signs, facilitating early intervention and reducing the burden on healthcare facilities.

I. INTRODUCTION

Health monitoring systems play a pivotal role in contemporary healthcare, providing individuals with valuable insights into their physiological well-being. The integration of advanced sensor technologies has led to the development of comprehensive monitoring systems capable of tracking multiple vital signs simultaneously. This introduction presents a health monitoring system that utilizes a pulse sensor, electrocardiogram (ECG) sensor, and pulse oximetry (SpO2) sensor to provide a comprehensive assessment of an individual's health status. Vital signs such as heart rate, cardiac activity, and blood oxygen saturation are essential indicators of overall health and serve as critical parameters for diagnosing and managing various medical conditions. Traditional methods of monitoring these vital signs often require cumbersome and intrusive procedures, limiting their accessibility and practicality for continuous monitoring in everyday life. The pulse sensor is an integral component of the health monitoring system, enabling continuous measurement of heart rate and pulse waveform characteristics. It employs photoplethysmography (PPG) to detect changes in blood volume and blood flow, providing valuable insights into cardiovascular health. By analyzing pulse waveform characteristics, the system can detect irregularities in heart rhythm and identify potential cardiac abnormalities. The ECG sensor, another key component of the system, measures the electrical activity of the heart. It records the waveform produced by the heart's electrical signals, allowing for the detection of arrhythmias, conduction abnormalities, and other cardiac conditions. The ECG sensor provides high-resolution data, enabling accurate and detailed analysis of the heart's electrical patterns. The SpO2 sensor measures the oxygen saturation levels in the blood, providing insights into the efficiency of oxygen delivery to vital organs and tissues. Abnormalities in SpO2 levels can indicate respiratory conditions such as hypoxemia or chronic obstructive pulmonary disease (COPD). Hypoxemia means a low level of oxygen in the arterial blood. The collected data from these three sensors are transmitted to the LCD display. In this project, we are going to use an Arduino UNO controller. The Arduino Uno board is based on the ATmega328P microcontroller, which operates at 16 MHz and has 32KB of flash memory for storing program code. It also has 2KB of SRAM for data storage and 1KB of EEPROM for non-volatile memory.

The heart is a vital organ responsible for pumping blood throughout the body, delivering oxygen and nutrients to various tissues and organs. The heart consists of four chambers: two atria which are at left and right and two ventricles which are at left and right. The process begins with the contraction of the atria, which allows blood to flow into the ventricles. This phase is known as diastole. When the atria contract, they will push the blood into the ventricles. The valves between the atria and ventricles which are known as the atrioventricular valves open to allow blood to pass through. This phase is known as atrial systole. When the ventricles contract, the atrioventricular valves close to prevent backflow of blood into the atria. The semilunar valves (pulmonary valve on the right side and aortic valve on the left side) located at the entrances of the pulmonary artery and aorta respectively, open to allow blood to be pumped out of the heart. This phase is known as ventricular systole. The contraction of the ventricles generates enough pressure to pump blood out of the heart. The right ventricle pumps deoxygenated blood to the lungs through the pulmonary artery, where it picks up oxygen and releases carbon dioxide. The left ventricle pumps oxygenated blood into the systemic circulation through the aorta, supplying oxygen and nutrients to the body's tissues. After contraction, the ventricles relax, allowing the chambers to refill with blood. The semilunar valves close to prevent blood from flowing back into the ventricles. This phase is known as ventricular diastole. The working of the heart is essential for maintaining proper blood circulation, ensuring oxygen

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and nutrient supply to the body's tissues, and removing waste products. Any disruption in the heart's functioning can lead to various cardiovascular conditions and compromise overall health.

II. LITERATURE REVIEW

[1]. The paper titled "Development of Smart Healthcare Monitoring System in IoT Environment" proposes a smart healthcare system that utilizes Internet of Things (IoT) technologies to monitor a patient's basic health signs and the conditions of the room in real time. The system employs five sensors, including a heart rate sensor, body temperature sensor, room temperature sensor, CO sensor, and CO2 sensor, to capture relevant data from the hospital environment. The collected data is transmitted to a portal where medical staff can analyze and process the information to assess the patient's condition.

The proposed system aims to address the growing need for portable healthcare monitoring systems and the shift toward telemedicine. By leveraging IoT technologies, the system offers a flexible and scalable approach to healthcare management. It enables remote monitoring of patients' vital signs and room conditions, allowing medical professionals to make informed decisions and provide timely care.

[2]. Heart rate is one of the vital signs of body health. In addition, the heart is the main pillar of the body in daily activities. Heart rate measurement can be done anywhere with the number of applications on a smartphone, for example on Google Playstore. Today, the Digital Lifestyle is inseparable from smartphones. This can be seen when daily activities cannot be separated from the smartphone. Today's digital lifestyle cannot be separated from music to support daily activities. Music is used by humans for various purposes. Some people use music to relax and others use music to inspire. This paper presents the relationship between heart rate and music so that it can be used for application development on smartphones (Afandi, et. al., 2014).

[3]. The literature review provided in the mentioned research paper focuses on the development of a low-cost and wearable SpO2 (oxygen saturation) device for health monitoring in the context of the Internet of Things (IoT). The paper discusses the importance of utilizing information technology in the healthcare field and the potential of IoT applications for real-time monitoring and medical record management.

The authors highlight that the heart's health condition can be represented by oxygen saturation and heart rate, which can be measured using a pulse oximeter. They emphasize the need for a wearable, high-mobility, and continuous monitoring device that can be accessed remotely through the global internet network. The goal is to enable patients and medical experts to monitor these parameters anytime and anywhere.

[4]. Smart Healthcare is important for people who need continuous monitoring which cannot be provided outside hospitals. It is also important at rural areas or villages where nearby clinics can be in touch with city hospitals about their patient's health conditions. This work presents a smart health monitoring system that uses biomedical sensors to check a patient's condition and uses the internet to inform the concerned. The biomedical sensors here are connected to an Arduino UNO controller to read the data which is in turn interfaced to an LCD display/serial monitor to see the output. Data is uploaded to the server to store and converted into JSON links for visualizing it on a Smartphone. An android application has been designed in order to easily see the patient's information by their doctors and family members. The proposed solution is based on integration between medical sensors and the controller responsible for collecting patients' physical parameters.

[5]. In this paper, they designed and implemented a wearable ECG (electrocardiogram) system with smartphones for real-time monitoring, self-diagnosis, and remote-diagnosis for chronic heart disease patients before sudden outbreaks. The smart shirt with ECG can be worn by inpatients or outpatients and monitored in real-time. Healthcare professionals can access patients' data wirelessly in real time with their smartphones. This system can be useful especially for senior citizens who live alone or have a disability. Therefore, this system can be utilized for remote medical systems to assist the elderly patients, for self-testing diagnostics, or for physicians to diagnose diseases of the circulatory system.

III.MOTIVATION

After going through different paper, we have come up with simulation on health monitoring system consisting Pulse Sensor, LM 35 and hardware on health monitoring system using Pulse Sensor, ECG module, SpO2 sensor.

IV.CONCLUSION

The Health Monitoring System (HMS) integrating a Pulse Sensor, LM35 Sensor, SpO2 Sensor, and ECG Sensor represents a significant advancement in healthcare monitoring technology.

The project aimed to develop a comprehensive and user-friendly solution to monitor multiple vital signs simultaneously, including heart rate, body temperature, oxygen saturation levels, and electrocardiogram (ECG) signals. Through the design and implementation of the HMS, we have successfully created a system that accurately measures and

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monitors these vital signs in real-time. The integration of the Pulse Sensor, LM35 Sensor, SpO2 Sensor, and ECG Sensor into a wearable device or smartphone application provides individuals with a holistic view of their health status. The HMS offers numerous advantages over traditional healthcare monitoring systems. By combining multiple vital sign measurements into a single system, users can conveniently and efficiently monitor their health without the need for separate devices. The advanced signal processing algorithms used in the HMS ensure accurate and reliable readings, enhancing the quality and reliability of the collected data.

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