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Healthcare Monitoring System for Remote Areas

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Abstract: Doctors now place a high importance on ongoing patient health monitoring since it gives them the chance to save a patient's life. So, the primary objective is to develop a patient monitoring system that can monitor a patient's various physiological data when they are in a remote location and provide the doctor with this information in real time. The information is made public online so that any doctor in the globe can access it. The necessity for a patient to visit the doctor is lessened via remote patient monitoring. The Raspberry Pi employed here is not only a sensor node but also a CPU, and IOT plays a significant part in this complete system by delivering several apps and services. This data can be sensed, gathered, and published online by an intelligent gadget. The paper suggests a general health monitoring system utilising a neural network-based HDPS (Heart Disease Prediction System). The HDPS system forecasts a patient's risk of developing heart disease. The technique uses medical parameters like sex, blood pressure, age, height, and weight for prediction. as an improvement over the work done in this area up until now.
Keywords: Raspberry Pi, patient, diseases, monitoring, data

I. INTRODUCTION

The increasing use of mobile technology and smart devices in the realm of health has been extremely beneficial for the entire world. Clinical healthcare has advanced significantly as a result of health professionals increasingly embracing the benefits that these technologies offer. According to the founding texts of the World Health Organization (WHO), everyone has a fundamental right to the highest quality of health. We strive to provide a novel method that employs sensors to follow patient vital data and predict, in advance, in terms of percentage, the possibility that a patient would experience certain health problem will suffer from a cardiovascular disease. We also use the Using the internet to inform doctors can help them help patients at the earliest stage of any problems, lowering the fatality rate. Patient monitoring outside of typical clinical settings (such the home) is possible using IoT-based patient health monitoring, which could increase access to care and lower healthcare expenditures.

A person's quality of life may be considerably enhanced by this. Patients can keep their freedom, prevent problems, and cut staff expenditures by doing this. Additionally, patients' families are informed that they will have support in case of difficulties.

The major goal of this system is to update the data online, notify the doctors of any abnormalities, and also determine whether the patient is suffering from a sickness. In order to perform the first task, a Raspberry Pi is connected to a database using a MySQL database module; in order to complete the second task, a Raspberry Pi is combined with a GSM module and a web interface.Because the data gathered through monitoring is so useful and can be applied to any type of medical research, this system has a very bright future. A remote health monitoring system powered by a Raspberry Pi is illustrated in this study. The Raspberry Pi is a diminutive single-board microcontroller about the size of a credit card that was developed to enhance the teaching of fundamental computer science in universities and developing nations. The project is meant to identify threats such as phishing, malware, and defacement. And is used by 96.6% accuracy. This initiative will assist both individuals and companies in identifying assaults that may occur when a user clicks on a malicious link. The remainder of the essay is structured as a thorough literature review in Section II. In Section III, the choice of system tools and problem identifications are covered. In Section IV, the system architecture and specific system design steps are covered. Future improvement is discussed as the paper's conclusion.

II. LITERATURE SURVEY

The existing telemonitoring health system cannot function without the Internet of Things (IoT) and cloud computing.

This system tracks the patient's physiological characteristics by gathering data from body sensors using a Raspberry Pi chip. The patient's health card is created by the doctor and then uploaded on a website where patients and doctors can connect and communicate without physically being there. The data can be updated, saved, and retrieved using cloud computing from any location in the world. It is ideal for remote locations without access to medical facilities.

Body wireless sensor Network (BWSN) is utilised in remote health monitoring systems employing the Internet of Things (IoT) to wirelessly send patient health parameters collected by a Raspberry Pi microcontroller to doctors and caregivers.

Due to long-range wireless technology, the patient's health emergency is swiftly identified, and prompt intervention results in the patient's life being saved. In-home patient monitoring systems are becoming more popular in recent years as a result of more expensive healthcare and lengthy hospital wait times. This system uses biosensors, wearable technology, and smart textiles to collect data on various body characteristics. It then transfers the data securely to the central node server using the Cipher text Policy Attribute Based Encryption (CP-ABE) approach. The server then distributes the gathered data to the hospitals for additional medical care. When there is an emergency, the server calls the ambulance Elderly people and individuals with chronic conditions who need ongoing monitoring can benefit greatly from it. The need for specialist geriatric healthcare monitoring systems is expanding due to the world's ageing population. By taking regular measurements of the body's parameters and reporting the results to the doctors, this system carries out fundamental health examinations. In a web application where patients and doctors can communicate, the result data are then presented as statements. It is divided into two parts: Quality and quantitative interviewing for a survey The testing results show that the damage detection model can operate effectively on static and dynamic websites, and that it has a detection accuracy of more than 99.26% overall and a false positive rate of less than 0.62%. The biggest difficulty is preparing older people for the development of new technology and helping them become accustomed to smartphones, computers, etc. By utilising intelligent devices and objects, IoT-based hcare successfully enhances the healthcare monitoring system while minimising the inefficiencies of the current healthcare system. The accuracy of data collection, accessibility to the real-time patient status, intelligent data integration, intelligent data maintenance through cloud services, etc. are all improved by smart devices with new and upgraded technology. IoT and smart devices have simplified and reduced the complexity of the healthcare system.

The usage of mobile technology and smart gadgets in the healthcare sector has had a significant impact on the world. The entire potential of M-health and E-health applications for developing and maintaining high standards of living is made known to people in the modern world. The major goal is to educate patients through advice of good eating habits and efficient training routines for enhancing their quality of healthy living, in addition to routinely monitoring patients' conditions through M-health systems.

III. SYSTEM DESIGN

A. Problem Analysis

Doctors are not present, thus the patient is unable to consult them, which may lead to an emergency scenario. Each person's personal health monitoring is regarded as being of utmost importance due to the rise in health issues in today's society.

The general health is being severely harmed by the increasingly stressed way of life. The number of people and hospital wait times have led to an increase in doctor fees, which is particularly hurting those who cannot afford the fees or who do not have serious illnesses but discover they have only after paying a substantial fee to the doctor.

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The implementation and integration of technologies, wired and wireless sensors, tracking technologies, identification, communication options, and the promising paradigm are all topics covered in this study. The primary objective of this essay is the work done in a variety of domains, including information science, telecommunication, and electronics. The survey in this work enhances the tracking sensors, identification sensors, and communication protocols..

IV. METHODOLOGY

A. System architecture Hardware

Fig.1 Arduino Board(A Tmega 328P Microcontroller)

This is an Atmel single-chip microcontroller from the Mega-AVER family. 23 general-purpose I/O lines, 32 general-purpose work registers, 3 flexible timers, 32 kB ISP flash memory with read/write functionality, 1 kB EEPROM, 2 kB SRAM are all features of Atmel's 8-bit AVRRISC- based microcontroller.

There include combiners/counters, comparison mode, internal and external interrupts, and serially programmable USART. In order to function, the gadget needs 1.85.5 volts. Approximately 1 MIPS are processed throughput per MHz by this product.

Numerous applications and autonomous systems that require an easy, affordable microcontroller typically use the ATmega328. This chip may be used the most frequently on the popular Arduino development platform, including the Arduino Uno and Arduino Nano variations.

B. Sensors: The sensors used here are: DHT11 sensor

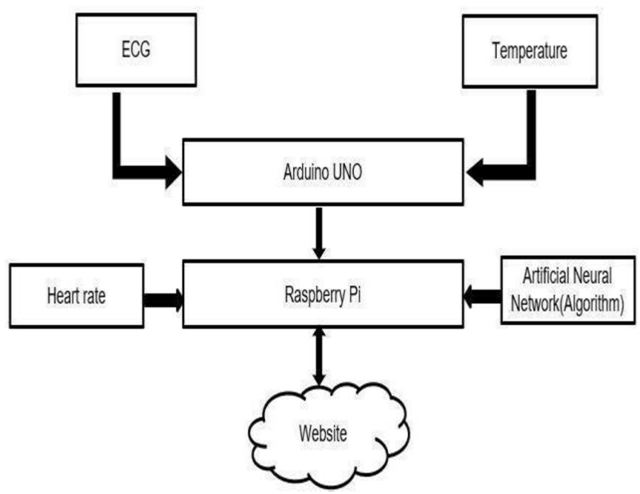
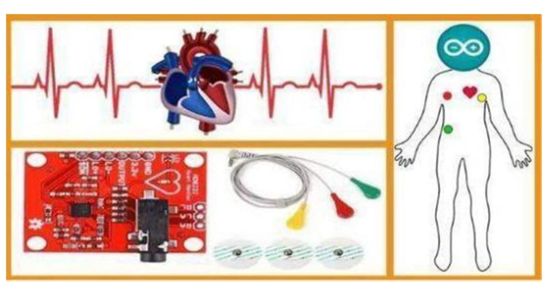


fig (2)

Fig. 2 . Shows the system architecture of proposed model.

The thermistor for measuring temperature and a capacitive humidity detector make up the DHT11 sensor. The dielectric in moisture-detecting capacitors is made up of two electrodes and a moisture-retention substrate. These changing resistance values are measured, processed, and converted to digital format by the IC.

The ECG sensor AD8232



fig(4)

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Fig.4 The ECG sensor AD8232, which stands for electrocardiogram, is a device used to assess and measure the electrical activity of the heart. Depending on how the heart works, the heart's activity is then measured and plotted or presented. Since the Raspberry Pi cannot analyse analogue data, the Arduino Nano takes the ECG's analogue output, converts it to digital, and then transfers it to the Raspberry Pi.

C. Artificial Neural Network

Artificial neurons that function as nodes in artificial neural networks can be seen as weighted directed graphs. It is a computer network that is modelled after the organic neural network that gives the human brain its shape. As with the Artificial neural networks have neurons that are connected to each other similarly to how neurons in the human brain are at various network layers with one another.

ANN is frequently utilised in several medical specialties particularly in the application of cardiology in medicine. Electrical signal analysis, medical picture analysis, and diagnostics all use ANN.

That is to forecast a patient's cardiac problems, a decision support system was created. The forecasts are based on previous databases on cardiac illness. The system accepts 13 inputs from medical words including age, height, blood pressure, and gender.

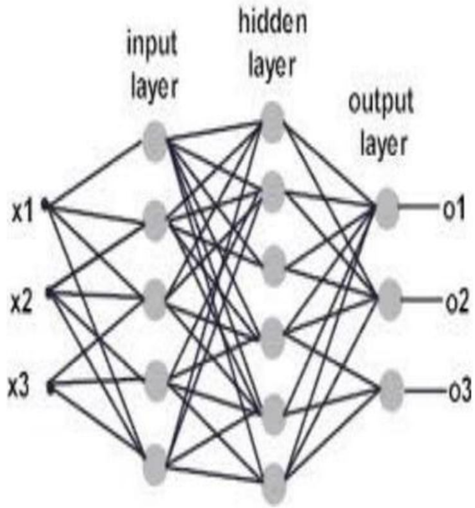
The system was created using the Multilayer Perceptron Neural Network approach using the backpropagation algorithm and (MLPNN) (BP).

D. Multilayer Perceptron Neural Network (MLPNN)

An input layer, an output layer, and one or more hidden layers make up an MLPNN. Each layer is made up of any number of nodes symbolised by tiny circles. A line between two nodes depicts the information flow from a node to a different. External node signals are sent to the input layer. The weighted connection link in the hidden layer provides the output for the input layer. carries out calculations and transmits the results to the output layer through a weighted link. The hidden layer performs the calculations and delivers the output to the output layer, which receives the output.

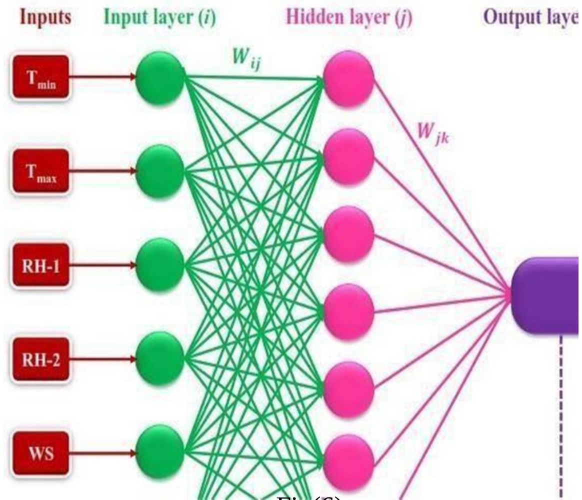
V. RESULTS AND DISCUSSIONS

After receiving accurate information from the patient, the doctor can access a website where they can view the patient's parameters and give real-time comments based on the patient's medical requirements. On dynamic webpages, sensor data is received. Columns can be used to display all sensor data. Patients should monitor the data to look for probable cardiovascular problems and should see a doctor if the results are not favourable. The Information and Timing column additionally contains information and data timing. Every two minutes, the server site sends the data to the dynamic website. As a result, every patient's medical history is kept, which can be used for improved remote healthcare and diagnosis.



fig(5)

Fig.5 Multilayer Preceptron Neural Network(MLPNN) fig(6)



Fig(6)

Fig.6 Configuration of (MLPNN)

VI. CHALLENGES

Network outages cannot be tolerated by equipment that need real-time data access, such as many medical devices. Maintaining connectivity is particularly challenging in mobile devices like wearables, which follow patients everywhere they go, across borders, and coverage zones. Cellular connectivity is typically the best option for IoT systems that span a large geographic area. Using an open roaming, unsteered SIM card, IoT devices can switch networks on their own and stay connected to the strongest signal. The number of networks that can be accessed is determined by the roaming agreements held by the SIM provider and the deployment sites. Velos IoT, for instance, offers global roaming agreements with 600+ networks in 210 different countries and territories.

VII. CONCLUSION

The proposed system uses technically sound gadgets (Arduino, Raspberry Pi, sensors), systems, and devices to expose the flaws in our current healthcare system as a result of the growing elderly population. It draws attention to and fixes the problems with conventional medical systems. Artificial neural networks are used to forecast cardiovascular disease, which aids patients in seeing anomalies and deciding if they require immediate medical intervention. Although this technology is useful for providing remote patient care, it can yet be improved in the future to increase its effectiveness.

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