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IOT BAESD ICU PATIENT MONITORING SYSTEM USING MACHINE LEARNING TECHNIQUE

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ABSTRACT

Present day's medical observation getting increase for different reasons, especially in pandemic situation it was become mandatory to continuous monitoring of patient health condition and to respond in emergency.

Patient in emergency has to be monitored 24 hours, when need system has to alert the concern team to act. Monitoring multiple patients at one time is difficult task to anyone.

We propose an NODE MCU board has been used in the system design along with body temperature sensor, heartbeat detection sensor, PIR Sensor and. In order to notify alarm conditions to the concerns, and NODE MCU -based application has been developed. It is observed that the data collected from the sensors are monitored in real-time and the buzzer is setup successfully when abnormal conditions occurred.

The system connects with mobile application, which is IOT based system to monitor the patient condition. And also Machine algorithm to predict the continuously generating sensors data. We use machine leaning algorithm Naive Bayes classifier.

INTRODUCTION

Recently, with the development of technology, home healthcare and remote monitoring of physiological data have gained importance. It is a popular implementation to track home healthcare of patients, particularly patients.

An patient monitoring system basically includes sensors and a microcontroller.

A biomedical sensor device is capable of sensing several vital physiological and physical data (ECG, body temperature, heartbeat, blood pressure, wetness etc.) from human bodies or environment and sending them to the microcontroller by using analog or digital outputs. It is important that the monitoring system generates alarms in abnormal conditions. Various wireless patient monitoring systems were previously proposed for different purposes.

One of the most important physiological data to track in such monitoring systems is body temperature, i.e. patient fever. Changes in body temperature of patient have a key role in the diagnosis and treatment of diseases. The body temperature should be continuously monitored. The maximum body temperature range should be 36-38 [degrees]C for these patients. Another crucial parameter to track is heartbeat rhythms. Cardiac arrhythmia can cause sudden deaths of patients, so continuously monitoring of the patient's heartbeat rhythm may be required. A finger heartbeat sensor is a low-cost, noninvasive and userfriendly device for monitoring heartbeat rhythms. It is also important to monitor bed wetting and perspiration of patients. Excessive perspiration may cause the patient be dehydrated, resulting in illness or exacerbation of existing disease. The major advantage of homecare systems for patient monitoring is that these systems can automatically collect physiological data without the requirement for guardians to constantly check patients, and can generate an alarm for abnormal conditions. It is easy for healthy guardians to react immediately to those alarm conditions. However, it may not be possible for hard of hearing guardian to react a patient movement or a voice alarm instantaneously. Therefore, alarm notifications must be visual or vibrant for those guardians.

In this study, a real-time patient monitoring system by using a microcontroller and android-based mobile devices is developed and implemented in order to be used especially for hard of hearing guardians.

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With the developed system, the physiological signals collected from a patient body are continuously monitored, and an alarm is generated in abnormal conditions. An Arduino Leonardo board has been used in the system design along with a body temperature sensor, a sound detection sensor, a finger heartbeat detector, and a humidity sensor. In order to notify alarm conditions to those guardians, an android-based application ,

Notification of alarm situations has been successfully provided via a vibrating smart watch, SMS, and LEDs (Light Emitting Diode) using Arduino board and android-based applications.

The experimental studies show that the developed system provides a timesaving implementation for home care patient monitoring systems.

SYSTEM ANALYSIS

Existing System

The traditional method for monitoring an emergency patients vital signs requires direct supervision from hospital staff.

Sometimes it is difficult to identify certain physiological changes which may be of concern.

Traditional monitoring techniques are difficult to wear for long periods of time and may cause discomfort to the patient.

Cost is very high.

Proposed System

A Smart Alert System is designed for SIDS monitoring. The main goal of the smart alert system is to reduce the response time in an SIDS scenario.

The microcontroller device (NODE MCU) is embedded with many sensors that are capable of measuring the body position, heartbeat rate, and temperature of the patient.

After a minimal data processing, if any critical event occurs the buzzer that is present in the system will trigger an alarm.

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ADVANTAGES:

Continues monitoring will help staff to have health update of patient, it is tension free environment to staff.

Immediate action can be taken in abnormal condition.

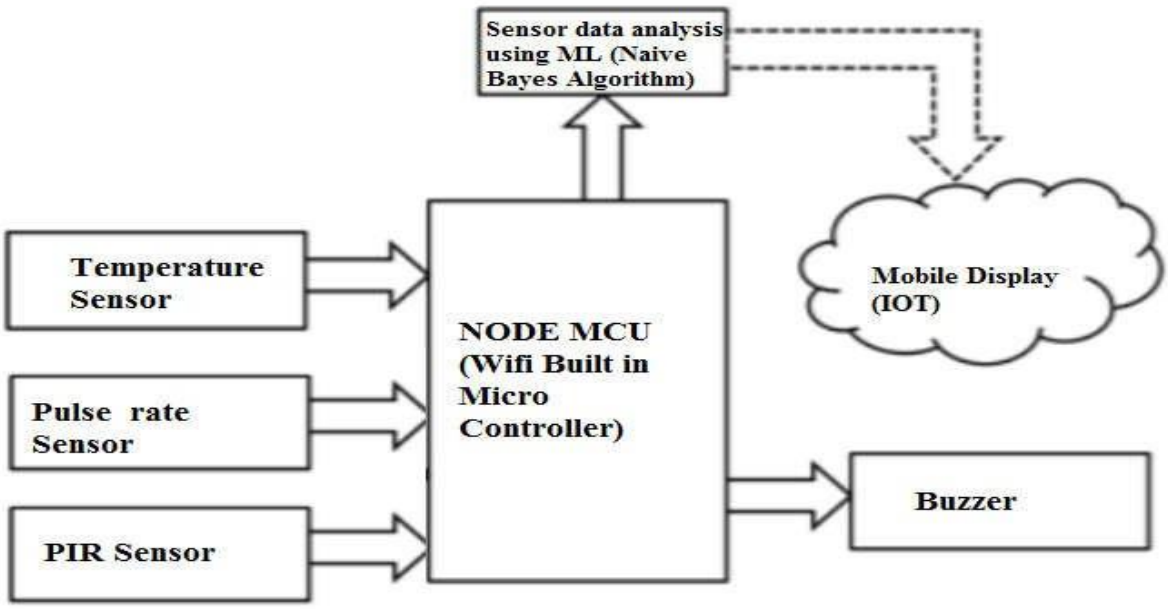

Fig 1: Block diagram of Proposed Model

COMPONENTS USED

- Heart Beat sensor (Pulse Sensor)
- Temperature sensor
- PIR Sensor
- Buzzer Alarm

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- Node MCU

PULSE SENSOR

Knowing the heart rate data is very helpful while doing exercises, actively studying, etc. But measuring heart rate is a difficult problem. So, a pulse sensor is used to overcome this problem. This sensor is a plug & play heart-rate sensor, utilized by artists, students, athletes, mobile & game developers, makers who desire to know the existing heart-rate data to use in their live projects.

This sensor merges a simple optical heart rate sensor through a circuit. This circuit is used for noise cancellation & amplification to get consistent pulse readings very quickly. It uses 4mA of power at 5V, so it is very useful in mobile applications. This article discusses an overview of pulse sensors and their working with applications.

Fig 2: Pulse Sensor

Temperature Sensor

The TMP36 temperature sensor is an easy way to measure temperature using an Arduino! The sensor can measure a fairly wide range of temperature (-50°C to 125°C), is fairly precise (0.1°C resolution), and is very low cost, making it a popular choice. In this tutorial we will go over the basics of hooking the TMP36 up and writing some basic code to read the analog input it is connected to.

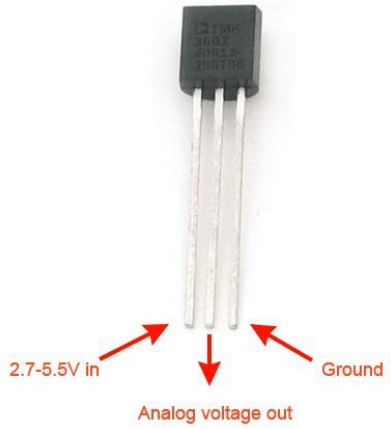

Fig 3: Temperature sensor

PIR Sensor

The electronic sensor used to detect the movement of human being within a certain range of the sensor is called as PIR sensor or passive infrared sensor
(approximately have an average value of 10m, but 5m to 12m is the actual detection range of the sensor).
Fundamentally, pyroelectric sensors that detect the levels of infrared radiation are used to make PIR sensors. There are different types of sensor and here let us discuss about PIR sensor with dome shaped Fresnel lens.

Fig 4: PIR sensor

Buzzer:

A buzzer is a small yet efficient component to add sound features to our project/system. It is very small and compact 2-pin structure hence can be easily used on breadboard, Perf Board and even on PCBs which makes this a widely used component in most electronic applications.

IOT Application- Things speak
Introduction

The Internet of Things(IoT) is a system of 'connected things'. The things generally comprise of an embedded operating system and an ability to communicate with the internet or with the neighboring things. One of the key elements of a generic IoT system that bridges the various 'things' is an IoT service. An interesting implication from the 'things' comprising the IoT

systems is that the things by themselves cannot do anything. At a bare minimum, they should have an ability to connect to other 'things'. But the real power of IoT is harnessed when the things connect to a 'service' either directly or via other 'things'. In such systems, the service plays the role of an invisible manager by providing capabilities ranging from simple data collection and monitoring to complex data analytics. The below diagram illustrates where an IoT service fits in an IoT ecosystem

One such IoT application platform that offers a wide variety of analysis, monitoring and counter-action capabilities is 'ThingSpeak'. Let us consider ThingSpeak in detail. What is ThingSpeak ThingSpeak is a platform providing various services exclusively targeted for building IoT applications. It offers the capabilities of real-time data collection, visualizing the collected data in the form of charts, ability to create plugins and apps for collaborating with web services, social network and other APIs. We will consider each of these features in detail below.

The core element of ThingSpeak is a 'ThingSpeak Channel'. A channel stores the data that we send to ThingSpeak and comprises of the below elements:

8 fields for storing data of any type - These can be used to store the data from a sensor or from an embedded device. 3 location fields - Can be used to store the latitude, longitude and the elevation. These are very useful for tracking a moving device.
1 status field - A short message to describe the data stored in the channel. To use ThingSpeak, we need to signup and create a channel. Once we have a channel, we can send the data, allow ThingSpeak to process it and also retrieve the same. Let us start exploring ThingSpeak by signing up and setting up a channel.

Getting Started
Open https://thingspeak.com/ and click on the 'Get Started Now' button on the center of the page and you will be redirected to the sign-up page(you will reach the same page when you click the 'Sign Up' button on the extreme right). Fill out the required details and click on the 'Create Account' button.

CONCLUSION

The system proposed in this paper tries to offer a reliable solution for patient sudden deaths prevention. It was designed to bring comfort and a better living for patients. So guardians are more rested because this system protects the patient. The solution is based on wireless sensor networks connected to a mobile device through Bluetooth that act as a sync. With the proper readings, in real time, it becomes possible the creation of a warning system based on notifications for patient death prevention. It is assumed that not all deaths are preventable, but many can be avoided with this system.

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