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RESEARCH ARTICLE

IOT BASED SMART HEALTH MONITORING SYSTEM

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ABSTRACT

People who require constant monitoring, which cannot be offered outside of hospitals, would benefit from smart healthcare. It's especially crucial in rural areas like villages, where neighbourhood clinics can communicate with city hospitals regarding their patients' health. This project shows a smart health monitoring system that employs biological sensors to monitor a patient's condition and the internet to notify those who need to know. The biomedical sensors are attached to an Arduino UNO controller, which reads the data and displays the results on an LCD display/serial monitor. The data is uploaded to the server, where it is stored and translated into a JSON link that can be seen on a smartphone. An Android application has been created to allow doctors and family members to conveniently view the patient's information. Heart attack has become a particularly fatal human disease in recent years. This assault cannot be predicted, but it can be detected by monitoring the human heartbeat, which is a critical health indicator for the cardiovascular system. Heart rate represents the state of health of the human circulatory system, which is influenced by factors such as stress at work, physical exertion before or after sports, and psychological factors. Unfortunately, some persons are unaware of their heart rate prior to or after engaging in a physical activity.

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INTRODUCTION

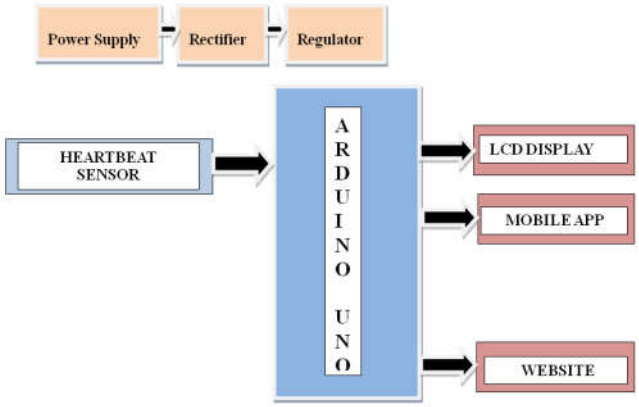
When blood flow is limited or blocked, a heart attack or myocardial infarction occurs. This causes a heart attack, which can result in death. This technology is based on a variety of devices, including embedded systems, personal gadgets like cell phones and tablets, and so on. This device is used by a large number of patients. Population ageing is unavoidable, and as civilization and science have progressed, the leading cause of death has shifted from infectious to preventable diseases. As a result, saving older individuals in the event of accidents or illness is critical. According to the World Health Organization (WHO), Cardiovascular Disease (CVD) is the leading cause of death worldwide, accounting for over half of all deaths. Every year, millions of people die from heart attacks or strokes all around the world. To avoid heart attacks, scientists created a heartbeat detector. People who have a heart attack typically die suddenly because they are unaware that the agony they are experiencing is due to a heart attack. Most people mistake heart attack discomfort for pain from other bodily issues, such as stomach pain. We can minimise the victim if we know what the suffering is actually like. Heart rate can be used to assess the health of our hearts. detailed the use of SPO2 and heart rate monitoring to determine the status of a heart attack caused by a variety of issues.

Patients have become more concerned about the quality of their healthcare, both at home and in hospitals. Telemedicine information technologies, particularly intelligent systems utilised to deliver high-quality healthcare monitoring and save on medical and human costs, have grown increasingly important. Computer-based portable embedded devices have pushed our healthcare to a new level, allowing people to handle their daily regular checkups at home, thanks to updated technologies. It's also critical to provide patients with ongoing monitoring in non-clinical settings. Such health management, however, is only possible if computer-based portable monitoring equipment with smart sensor technologies are accessible. There is a comprehensive package of hardware and software in our work, "Smart Health Monitoring System." i.e. a variety of biological sensors, such as temperature and heartbeat rate sensors, are connected to an Arduino UNO microcontroller, which reads the data from the sensors. These are wirelessly delivered to the server and then to the mobile app.

METHODOLOGY

Our development system is divided into two: Hardware and Software parts. The hardware module is embedded on Microcontroller.

Microcontroller serves as the main control of all the operations of the hardware components. IOT module acts as an intermediate between the sensor and the smartphone, providing a two-way communication, and connects the hardware and software modules of the system to the Android.



ATMEGA328P MICROCONTROLLER

An The high-performance Atmel Pico Power 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities, 1024B EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, a 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes.

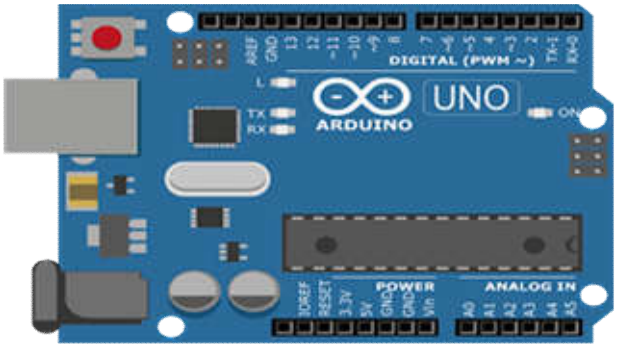


Fig 1. Arduino Uno

The device operates between 1.8-5.5 volts. Each of the 14 digital pins and 6 Analog pins on the Uno can be used as an input or output, using pinMode(), digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50k ohm. A maximum of 40mA is the value that must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller. The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analog Reference () function.

HEARTBEAT SENSOR

In addition to the optical sensor assembly, an amplifying circuit is needed to 'boost and shape' the feeble signal coming off the optical sensor. Next figure shows the entire circuit diagram of a typical optical heart rate monitor. Surprisingly its output is strong enough to make a green light blink every time the heart beats. Since the Pulse Sensor amplifies the raw signal available from the optical sensor, and normalizes the pulse wave around Vcc/2 (midpoint in voltage), if the amount of light incident on the light receiver part remains constant, the signal voltage will stay at (or close to) 2.5VDC at 5VDC supply. The output signal value then will be 512 (midpoint of the ADC range). Green light from the light sender that is reflected back to the light receiver changes during each pulse – the signal shoots up with more light, and with less light, the reverse.

Fig 2. Heartbeat sensor

LIQUID CRYSTAL DISPLAY (16X2): The term LCD stands for liquid crystal display. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred for multi-segment light-emitting diodes and seven segments. The main benefits of using this module are inexpensive; simply programmable, animations, and there are no limitations for displaying custom characters, special and even animations, etc. A 16×2 LCD has two registers like data register and command register. The RS (register select) is mainly used to change from one register to another.

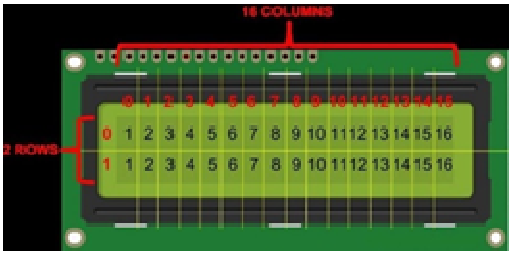


Fig 3. Liquid crystal display (16x2)

When the register set is '0', then it is known as command register. Similarly, when the register set is '1', then it is known as data register.

PIEZOELECTRIC BUZZER: When generating sound using electronics, the first component that comes to mind is a speaker. Most speakers consist of two electromagnetic coils, called "voice coils". One of the coils is attached to a flexible material called the speaker cone. When current is applied to the voice coils, an electromagnetic field is generated. The force generated between the fields moves coils which in turn

makes the speaker cone vibrate. We perceive these vibrations in the air as sound.

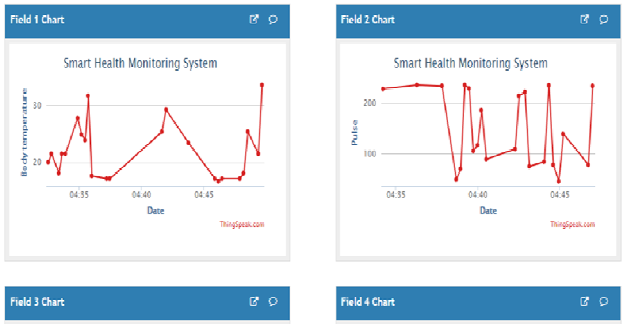


Fig 5. Heartbeat sensor value in thing speak

EXPERIMENTAL RESULTS ON MICROCONTROLLER: The Arduino board is currently connected to the heartbeat sensor; however, once the microcontroller and sensor setup is complete, the board must be connected to a power source. We're using the USB port to connect the microcontroller to the PC since we're using sequential correspondence to present the result of the identified heart beat. Currently, the software is compiled and sent to the Arduino board using the Arduino compiler, and the result is displayed on the sequential screen of the claimed compiler, as well as the BPM. Currently, the discovered data may be saved into an exceed expectancies sheet using the PLX-DAQ device, and we will use java code to convert the simple qualities from the pulse sensor into BPM esteems. Finally, we can access the online entry, where a specialist can log in and view the data in the specialised module.

CONCLUSION

A Smart Health Monitoring System was proposed and executed by us. It has proven to be effective. We saved patient data, such as temperature and heart rate, to an SD card using biomedical sensors. The information is then uploaded to the server. We also created the s-Health android application. Patients can use this app to find nearest hospitals, home remedies, and drug reminders, while doctors can use the s-Health application to diagnose their patients' health parameters while sitting far away from them.

We can improve the system's functionality in the future by adding more sensors and making our app more dynamic in terms of neighbouring hospitals and home treatments.

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