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An IOT Based Ambulance Tracking with Patient Health Monitoring System using GPS and GSM

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ABSTRACT
Vital signs monitoring and Medical diagnostics demands more technological solutions to cope with new methods of treatment. Continuous monitoring and information processing tools are vital to a physician with several patients under his care. Immediate medical attention to critically ill patients and accident victims requires a system to transmit vehicle location information. Technology plays a major role in not only monitoring health care parameters but also transmitting data and displaying it. The Internet of Things (IoT) is basically a cloud of interconnected devices where thing refers to the physical entity it could be a microcontroller or sensor or could be an actuator. This proposed system presents design of a monitoring system for emergency patient even during transportation to hospital in an ambulance. Here, we are designing and building a working prototype for low-power, wireless, wearable physiological monitoring system implemented using with the help of embedded system, Sensors, IoT, GSM and GPS technology. This project performs three main functions. First one is Patient health monitoring; second one is tracking the Ambulance which is carrying the Patient and third one is to send above two details to the Hospital or Doctor using GSM and the vital parameters values to the cloud using Wi-Fi technology.
Keywords: GSM, GPS, IoT, Sensors, tracking ambulance location

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I. INTRODUCTION

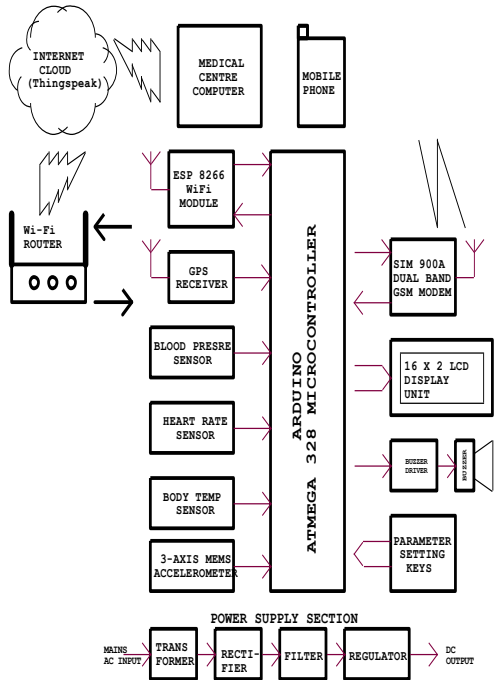
A centralize monitoring system is required in hospital which have information of accident victim vehicle and ambulance location. The doctor needs to understand the physical and physiological condition of the patient so that the right decision regarding administration of drugs and transport destination can be appropriately taken. Hence there is a need for communication between the staff of the ambulance and the monitoring station. The requirement can be achieved by using system in ambulance which uniquely transmits location information and status of patient through parameters i.e. heart beat rate and temperature etc. The system needs to include biomedical sensors to transmit status of patient. All systems are connected to each other through wireless communication which transmit information and data .Use of GPS and GSM modems for higher communication links will make system more effective and fast response Even with this there is also need of traffic control during transportation of emergency patient so valuable time of response can be saved. System will be interfaced with wireless RF module to transmit low signal. Including all these requirements system will found to be very useful for emergency treatment of patient during transportation. Proposed project achieves all requirements by including four units called as Ambulance unit, Monitoring Unit, Vehicle unit and Signal Unit. The Reason behind this project is to design a system for monitoring the patient's body at any time using internet connectivity. The function of this system is to measuring some biological parameter of the patient's body like Temperature, Heartbeat, Blood pressure , by using sensors and the sensors will sense the body temperature ,heartbeat and blood pressure of the patient and sends the values to IOT Cloud platform through WIFI-Module. All information about the patient health will be stored on the cloud, it enables the doctors to monitor patient's health, where the doctor can continuously monitor the patient's condition on his Smart phone. The results showed that this project can effectively use Wi-Fi technology to monitor patient health status. And the power consumption of Wi-Fi module (ESP8266) can be reduced as much as possible. Thus, the designed system provides low complexity, low power consumptions and highly portable for healthcare monitoring of patients.

II. PROPOSED SYSTEM

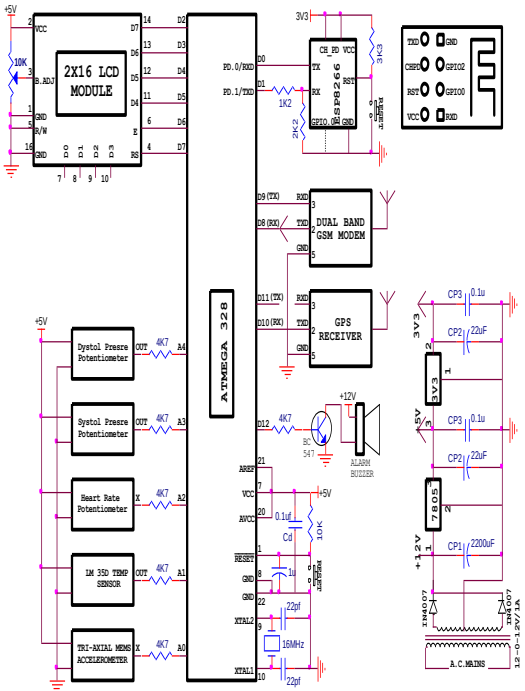
Here, we are designing and building a working prototype for low-power, wireless, wearable physiological monitoring system implemented using easily available components. Using proposed system we can monitor critical health parameters from anywhere on the earth with the availability of internet. The non-invasive system supports physiological monitoring of blood pressure, heart rate, body temperature and orientation to determine falls. The sensors are integrated into a wearable device that can be used to monitor the health and wellness of various patient populations. Data collected by the sensors are sent wirelessly to a cloud platform for storage and visualization. The system continuously measures these parameters and displays them on a local LCD panel and also uploads them into Thingspeak cloud platform using a WiFi connection. It also compares these parameters with their preset minimum and maximum values stored in the system's memory. It continues to monitor the parameters periodically, unless an abnormality is found in the parameters. In the event of abnormality, it sounds a local alarm to alert the people around and a text SMS message is sent to the doctor with the patient details and authentication to cloud database. The implemented system consists of an Atmega AVR microcontroller (ATmega328) as a main processing unit for the entire system and all the sensor and devices can be connected with the microcontroller. The sensors can be operated by the microcontroller to retrieve the data from them and it processes the analysis with the sensor data and updates it to the cloud through Wi-Fi module connected to it.

III. METHODOLOGY

This system consists of an Atmega AVR microcontroller (ATmega328) as a processing unit for the entire system, and all the sensor are connected with the microcontroller. The sensors obtain bio-parameters like body temperature, systole and diastole pressures, heart rate and body orientation, from the patient in analog form and they are read by the microcontroller to convert them to digital to retrieve their values and displays them on a local LCD panel. The microcontroller compares these parameters with their preset minimum and maximum values stored in the system's memory and analyzes them to find any abnormalities and periodically upload them to the Thingspeak cloud platform, through Wi-Fi module. in the event of abnormality, it sounds a local alarm to alert the people around and a text SMS containing location and values of all bio-parameters is sent to a Hospital's/Doctor's mobile. That SMS can intimate doctor about person's location and health condition along with the patient details and authentication to cloud database. By using the bio-parameters values, doctor can do advance preparations for treatment of the patient, hospital can prepare their staff for proper treatment of coming patient. It uses google maps to display location for displaying location by taking latitude and longitude values from SMS.



IV. CIRCUIT DIAGRAM AND ITS OPERATION



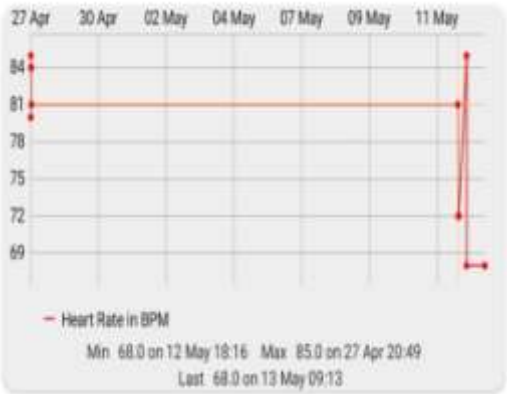
The circuit diagram of the IOT based Wearable Armed Personnel Health Condition Monitoring system is shown in the above figure. It consists of ATmega328 Microcontroller, Heart Beat Sensor, Body Temperature Sensor, MEMS Accelerometer Sensor, ESP 8266 Wi-Fi Module, Dual Band GSM MODEM, GPS receiver, LCD Display Unit and Power Supply Units.

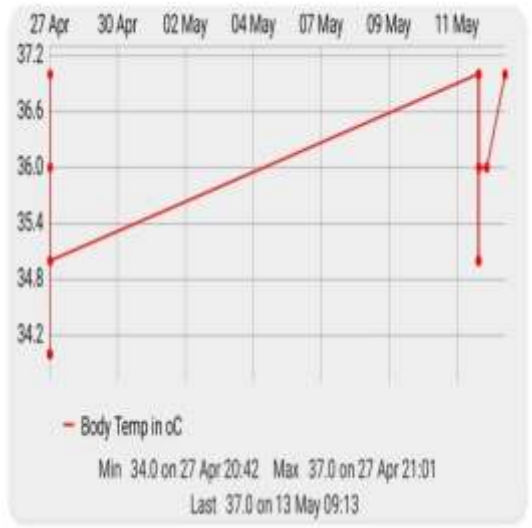
The Atmega 328 microcontroller is working as a small embedded computer which performs all the control functions of the system by executing the program stored in its internal flash program memory. We are using potentiometers to provide the vales corresponding to Systole Pressure, Diastole Pressure and Heart Rate to the microcontroller. This enables us to create normal or abnormal conditions of the bi-parameters and study the proper functioning of our prototype. A potentiometer is a manually adjustable variable resistor with 3 terminals. Two terminals are connected to both ends of a resistive element, and the third terminal connects to a sliding contact, called a wiper, moving over the resistive element. The position of the wiper determines the output voltage of the potentiometer. The potentiometer essentially functions as a variable voltage divider. The resistive element can be seen as two resistors in series (potentiometer resistance), where the wiper position determines the resistance ratio of the first resistor to the second resistor. A potentiometer is also commonly known as a potmeter or pot. The most common form of potmeter is the single turn rotary potmeter. This type of pot is often used in audio volume control (logarithmic taper) as well as many other applications. Different materials are used to construct potentiometers, including carbon composition, cermet, wirewound, conductive plastic or metal film. The three potentiometers, corresponding to Systole Pressure, Diastole Pressure and Heart Rate, are connected between Vcc and Ground terminals of the power supply and their middle terminals produce an analog voltage proportional to its wiper (spindle) position. This analog voltage is fed to analog input pins of the Atmega 328 microcontroller. These analog signals are converted into digital numeric value by the microcontroller and are used as present values of Systole Pressure, Diastole Pressure and Heart Rate respectively, for further evaluation. The internal ADC section of the microcontroller converts them into 10-bit digital values and are stored locally or sent to the remote server. The 16X2 LCD is interfaced in 4-bit mode and is connected on port pins. The RS and En pins are connected to port pins and RD/WR pin is connected to ground. The microcontroller sends ASCII codes of the characters to be written on LCD through these pins. This system is connected to the network through the Wi-Fi router and has the ability to send data to the remote server on the Internet or to the Cloud services using HTTP protocol. The sensor data gathered from IoT devices are stored into the Database in the Cloud to be available for users. This access to information is gained by users from any location using their desktop computers, tablets or smart phones with an App. Apart from this monitoring role of the system, users can control actuators via IoT devices through the Internet.

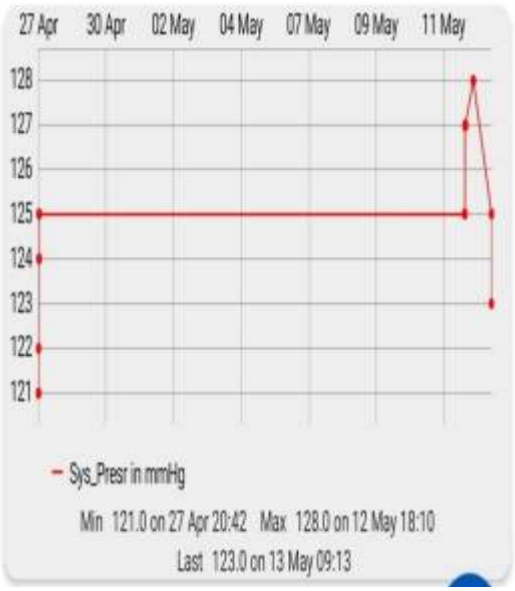
After the power switch is turned on or a reset is done, the microcontroller starts to function. In the beginning, it initializes all peripherals attached to it and displays the title messages. Then it searches for the Wi-Fi hotspot and connects to internet through the ESP 8266. Then it reads the present parameter values from various sensors attached to it using ADC and displays them on the LCD display and checks if any parameter has crossed its threshold value. If none of the parameters are abnormal, it reenters into the regular monitoring loop. The sensor and IOT side unit reads the analog voltages arriving at analog input pins of Atmega 328 microcontroller and displays them on LCD display and, periodically formulates a data packet to send to the Thingspaek cloud server through ESP 8266 Wi-Fi Module. It uses the IP address of Thingspaek and user's WRITE API KEY to send data.

V. THE EXPERIMENTAL RESULTS

With the help of this project we are able find out the location of ambulance and at the same time we are able to monitor various health parameter of a patient. These parameters are temperature, heart beat rate and blood pressure. A text SMS containing location and values of all the sensors is sent to a Doctor's mobile.







VI. CONCLUSION

The primary aim of this project work was to develop an IOT based patient's multiple bio-parameters monitoring and emergency alerting and location tracking system. It used the most modern techniques and tools to achieve the objectives. It used temperature sensor for measuring the body temperature, MEMS accelerometer for determining fall of the person and potentiometers to enter the values of Systole, Diastole pressures and Heart rates. This system collected those parameter values and compared with their standard set point values and displayed them on LCD display and sent those values to Thingspeak cloud server for storage and visualization. If any deviation from the standard values were found, it sends an alert SMS using GSM Modem. It collects the location information through GPS receiver and uses Wi-Fi Modem to connect to Wi-Fi network or a hotspot. It inserts values of all parameters, location information and the ID and password to log in to Thingspeak cloud. By combining GPS and GSM with this on-body smart sensor can help to communicate the medical emergencies and track the location of impact.

The experimental results seem to confirm the usefulness of such a system. Thus we can conclude that this system will act as a lifeguard to the critically ill patients all over the globe. In future, a portable handheld sensor device with more sensing options may be developed to aid the patient monitoring and tracking.

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