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IoT BASED COMATOSE PATIENT HEALTH CARE SYSTEM USING ARDUINO

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***Abstract*---The Internet of Things is a rising subject of specialized, social, and financial essentialness. IoT includes in different offices like Medical businesses, Automobile ventures, Manufacturing enterprises, and so forth. Presently a day's utility segments regular articles are being joined with Internet network and incredible information explanatory capacities that guarantee to change the manner in which we work, live, and play. Nowadays, for coma persistent a Dynamic Service Non Dependency Verification has been executed utilizing IoT. The principal procedures of this undertaking start with equipment interface. The equipment has been structured utilizing Arduino controller board. In subsumption different sensors can be associated through the controller board interface. The fundamental goal of this task is to build up an online application to correspondence with a web server in a verified way for coma patients. Thesensors worth will be transferred in an incorporated cloud server. The proposed system uses a heterogeneous IoT plan to verify correspondence between a sensor hub and an Internet hub and this plan is indistinct against different conditions.**

Keywords—Smart health system, Remote monitoring, Physiological conditions, Comatose patient, Android application.

I. INTRODUCTION

Continuous measurement of patient parameters such as heart rate and rhythm, respiratory rate, blood pressure, blood-oxygen saturation, and many other parameters have become a common feature of the care of critically ill patients. When accurate and immediate decision-making is crucial for effective patient care, electronic monitors frequently are used to collect and display physiological data. Increasingly, such data are collected using non-invasive sensors from less seriously ill patients in a hospital's medical-surgical units, labor and delivery suites, nursing homes, or patients' own homes to detect unexpected life-threatening conditions or to record routine but required data efficiently. We usually think of a patient monitor as something that watches for—and warns against—serious or life-threatening events in patients, critically ill or otherwise. Patient monitoring can be rigorously defined as "repeated or continuous observations or measurements of the patient, his or her physiological function, and the function of life support equipment, for the purpose of guiding management decisions, including when to make therapeutic interventions, and assessment of those interventions.

IoT

The Internet of things (IoT) describes the network of physical object "things" that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the Internet.

The definition of the Internet of things has evolved due to the convergence of multiple technologies, real-time analytics, machine learning, commodity sensors, and embedded systems. Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including

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home and building automation), and others all contribute to enabling the Internet of things. In the consumer market, IoT technology is most synonymous with products pertaining to the concept of the "smart home", including devices and appliances (such as lighting fixtures, thermostats, home security systems and cameras, and other home appliances) that support one or more common ecosystems, and can be controlled via devices associated with that ecosystem, such as smartphones and smart speakers.

There are a number of serious concerns about dangers in the growth of IoT, especially in the areas of privacy and security, and consequently industry and governmental moves to address these concerns have begun including the development of international standards.

II. METHADOLOGY

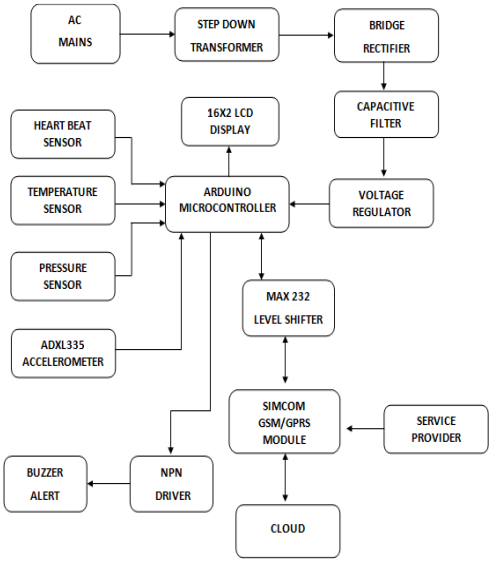

Fig 1. Block diagram

AC mains are described in order to fetch the power from the AC main source and which is further step downed by the step down transformer in order to get the low voltage AC signal from the high voltage Ac signal. Thus obtained AC signal is processed through bridge rectifier in order toextract the DC voltage which is required to operate the microcontroller. Thus the obtained DC source is an unregulated and rippled DC power source, the capacitive filter and voltage regulator like 7805 are used to obtain regulated DC power source for the microcontroller operation.

The heartbeat sensor, temperature sensor and pressure sensor values are fed to the analog channel of arduino microcontroller unit and hence it is decoded and compared for the predefined threshold values of the hearbeat, temperature and pressure. Once the sensor values breaches or exceed the predefined threshold value, the alert SMS and call notification is sent to the doctor. Additionally when the patient got conscious, immediately the call and sms notification is sent to the doctor and care tacker in order to treat them in right time and cure them.

Power Supply

A regulated power supply is an embedded circuit; it converts unregulated AC (Alternating Current) into a constant DC. With the help of a rectifier it converts AC supply into DC. Its function is to supply a stable voltage (or less often current), to a circuit or device that must be operated within certain power supply limits. The output from the regulated power supply may be alternating or unidirectional, but is nearly always DC (Direct Current). The type of stabilization used may be restricted to ensuring that the output remains within certain limits under various load conditions, or it may also include compensation for variations in its own supply source. The latter is much more common today.

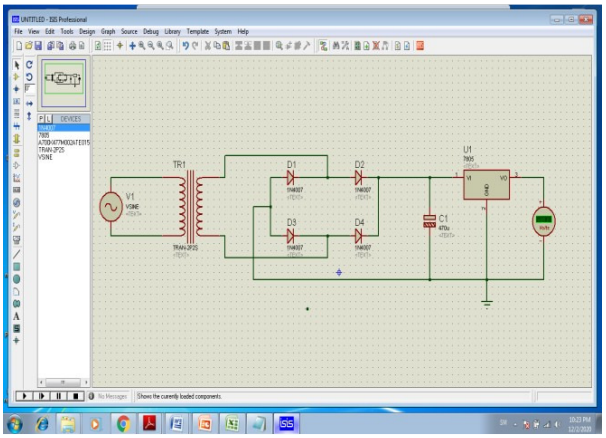

Fig 2. Power Supply

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Arduino Uno

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 Analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter. Arduino Uno has a number of facilities for communicating with a computer, another Arduino board, or other microcontrollers.

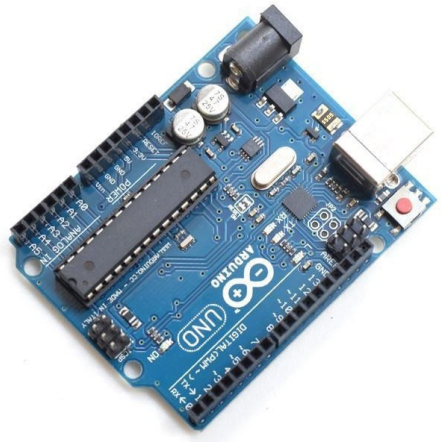

Fig 3. Arduino uno

Voltage Regulator

Regulator IC units contain the circuitry for reference source, comparator amplifier, and overload protection all in a single IC.

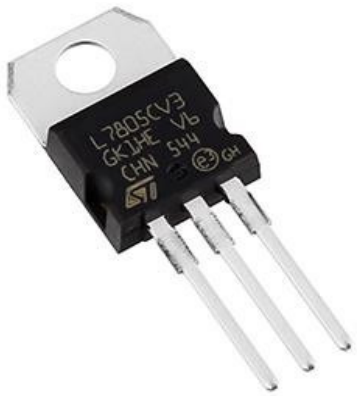

Fig 4. Voltage regulator

The regulators can be selected for operation with load currents from hundreds of milli amperes to tens of amperes, corresponding to power ratings from milli watts to tens of watts. The series 78 regulators provide fixed positive regulated voltages from 5 to 24 volts.

The series 79 regulators provide fixed negative regulated voltages from 5 to 24 volts. A fixed three-terminal voltage regulator has an unregulated dc input voltage, Vi applied to one input terminal, a regulated dc output voltage, Vo, from a second terminal, with the third terminal connected to ground. The series 78 regulators provide fixed positive regulated voltages from 5 to 24 volts. Similarly, the series 79 regulators provide fixed negative regulated voltages from 5 to 24 volts. For ICs microcontroller, LCD - 5 volts. For alarm circuit, op-amp, relay circuits -12 volts.

16x2 LCD display

This is an LCD Display designed for E-blocks. It is a 16 character, 2-line alphanumeric LCD display connected to a single 9-way D-type connector. This allows the device to be connected to most E-Block I/O ports. The LCD display requires data in a serial format, which is detailed in the user guide below. The display also requires a 5V power supply. Please take care not to exceed 5V, as this will cause damage to the device. The 5V is best generated from the E-blocks Multi programmer or a 5V fixed regulated power supply.

The 16 x 2 intelligent alphanumeric dot matrix displays is capable of displaying 224 different characters and symbols. A full list of the characters and symbols is printed on pages 7/8 (note these symbols can vary between brand of LCD used). This booklet provides all the technical specifications for connecting the unit, which requires a single power supply (+5V).

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Fig 5. 16X2 LCD display

GSM Modem

This GSM Modem can work with any GSM network operator SIM card just like a mobile phone with its own unique phone number. Advantage of using this modem will be that its RS232 port can be used to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily using this.

The modem can either be connected to PC serial port directly or to any microcontroller through MAX232. It can be used to send/receive SMS and make/receive voice calls. It can also be used in GPRS mode to connect to internet and run many applications for data logging and control. In GPRS mode you can also connect to any remote FTP server and upload files for data logging.

Temperature Sensor

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtracta large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 µA from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a −55° to +150°C temperature range, while the LM35C is rated for a −40° to +110°C range (−10° with improved accuracy). The LM35 series is available packaged in hermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package. The LM35D is also available in an 8-lead surface mount small outline package and a plastic TO-220 package.

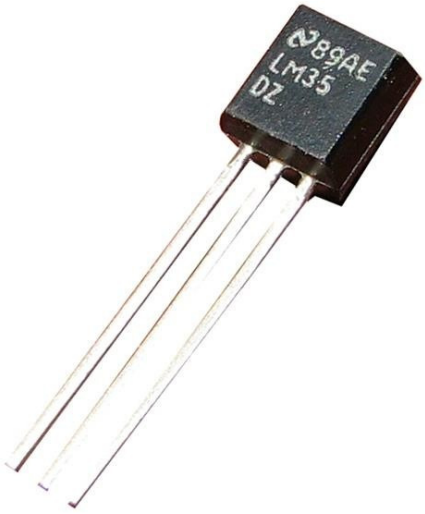

Fig 6. Temperature sensor

Heart Beat Sensor

Heart beat sensor is designed to give digital output of heat beat when a finger is placed on it. When the heart beat detector is working, the beat LED flashes in unison with each heart beat. This digital output can be connected to microcontroller directly to measure the Beats Per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse.

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III. EXPERIMENTAL RESULTS

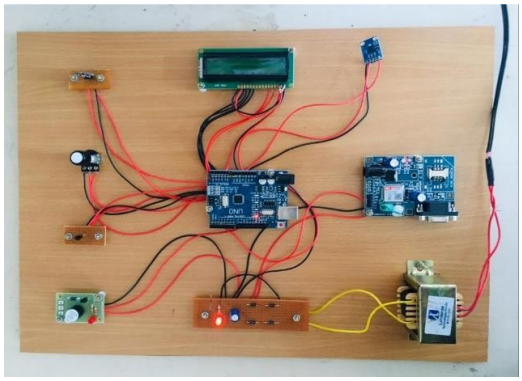

Fig 7. Proposed system

The system is IoT based and it delivers a text message to the consultant doctor. The heart beat sensor, temperature sensor and pressure sensor values are fed to the analog channel of Arduino microcontroller unit. If the sensor values reaches the threshold value or patient become concscious the alert SMS and call notification is sent to the doctor and care taker.

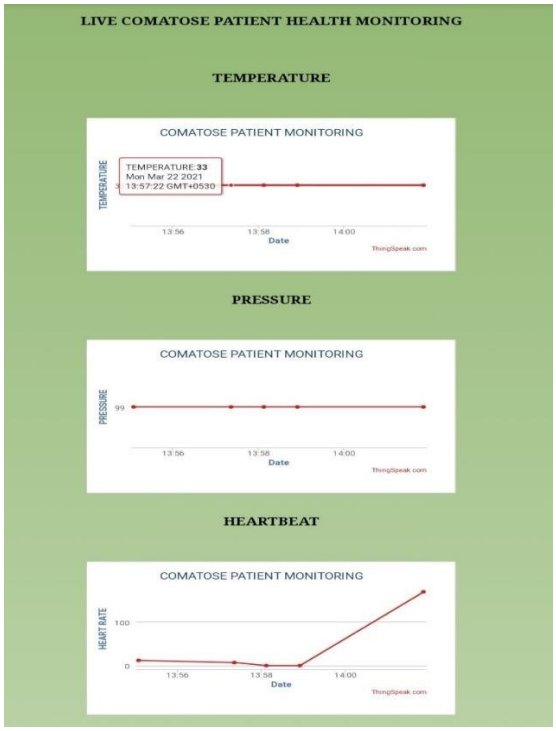

Fig 8. IoT based patient health data logging in webpage

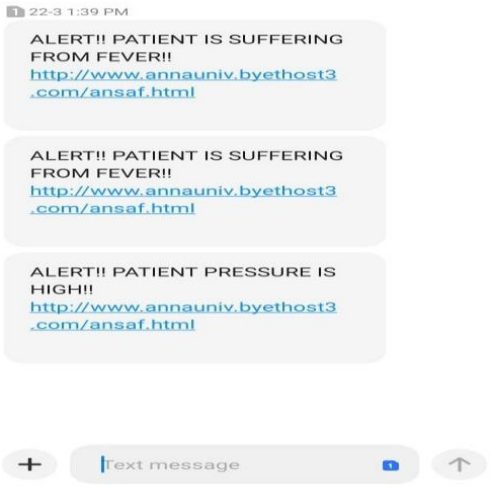

Fig 7. SMS notification alert when patient is in critical stage

IV. CONCLUSION

By using this project we can monitor the comatose patient continuously and hence the body parameters of comatose patient like heart rate, temperature and pressure will be logged in the cloud platform. Additionally when the comatose patient gets consciousness, the alert notification will be sent to doctor and the call is activated to the care taker immediately.

the system which have been developed in this research can monitor physiological conditions of patients, proven by high percentage of accuracy in detecting heart beatrate98%,respiratory rate; 94% and pressure of patients; 100%. The system is also capable of producing notification when abnormal condition is detected.

Overall, the application developed in Android device can functions properly in monitoring data physiological condition and received notification when anomaly data is detected.

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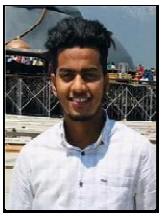
Authors Biography



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