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IOT Based Heart Beat Monitoring System Using Sensors

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Abstract: This paper work proposes, an autonomous Wireless Sensor Network (WSN), based on energy harvesting and wireless transfer of energy. In order to optimize the performance of this system, power allocation techniques proposed, aiming to energize the monitoring sensors wirelessly. This paper aims by optimizing the parameters of the system, a self-sustainable WSN in a power substation can be successfully deployed.

Keywords: Wireless Sensor Network, Power Substation, Internet-of-things, signal conditioning unit.

I. INTRODUCTION

Health should be given more importance in person's life. Health monitoring systems has been developed in these few years that can increase in providing better health. Several sensors are employed to monitor the human health conditions and the information from these sensors is transmitted to the cloud. A doctor or person who must know about the health of the patient can access this data from far away from the patient with the help of cloud. Internet-of-things (IoT) is simply defined as devices that connect one another and interact using internet. IoT generates different amount of information that can be process by cloud computing. It is good and intelligent technique which reduces human effort and easy access to physical devices. This technique also has independent control feature by which any device can control without any human interaction.

Doctor's facilities continuously require exceptional administration. The database of every last bit patients ought to be helpful sufficient. Be that as also, there ought to a chance to be information avoidance. Likewise the tolerant information ought further bolstering be kept private in the event. Social insurance may be the the majority critical concern from claiming numerous nations in the universe. Enhancing those exists of patients particularly in the weaker parts of the particular social order which incorporate those elderly, physically also rationally handicapped and additionally the chronically sick patients may be the main consideration will make progressed. On existing system, those information is recorded in the manifestation from claiming paperwork or looking into general stockpiling server. However by and large that information will be approachable on every last one of staff Furthermore doctors. Subsequently we need aid proposing another route the place tolerant What's more doctors fit to correspond through versatile requisition Furthermore web requisition. To doctor's facilities there need aid procurements to nonstop screening from claiming patients. Their heartbeats need aid ceaselessly monitored. There may be no procurement on check those parameters the point when they exchange will home. What's more consequently there is an opportunity that the ailment might come back once more. Patient-Health's information (high-temperature, Cardiac frequency, position) will be every now and again measured and transmitted through net-server. Time about sending (say each 3 min) could a chance to be situated. Checking individual takes in tolerant particular edge. Approximately the standard body-temperature of a tolerant is 37?c while lone persnickety senses hot In as much body temperature is 37. 0˚c.By utilizing a averaging technobabble In An moderately long time, eyewitness could take these thresholds for patients. Utilizing same provision previously, doctor's advanced mobile phone, specialist might perspective as much patient's wellbeing status. At any of the parameter dives past the edge esteem he will get a caution notice.

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II. LITERATURE REVIEW

To develop health monitoring system i.e. it measures body temperature and heart rate. To design a system to store the patient data over a period of time using database management. To do analysis of collected data of sensors.

Nabil Alshurafa [1] et al describes an enhanced RHM system, Wanda-CVD that is smartphone-based and designed to provide wireless coaching and social support to participants. CVD prevention measures are recognized as a critical target by health care organizations worldwide i.e. the World Health Organization, the Institute of Medicine and a primary goal for Healthy People 2020.

Marjorie Skubic [2] et al presents an example of unobtrusive, continuous monitoring in the home for the purpose of assessing early health changes. Sensors embedded in the environment capture behavior and activity patterns. Changes in patterns are detected as potential signs of changing health. Wrest present results of a preliminary study investigating 22 features extracted from in-home sensor data. A 1-D alert algorithm was then implemented to generate health alerts to clinicians in a senior housing facility.

Andreas K. Triantafyllidis [3] et al presents the design and development of a pervasive health system enabling self-management of chronic patients during their everyday activities. The proposed system integrates patient health monitoring, status logging for capturing various problems or symptoms met, and social sharing of the recorded information within the patient's community, aiming to facilitate disease management.

Nabil Alshurafa [4] et al provides a technique to improve smartphone battery consumption and examine the effects of smartphone battery lifetime on compliance, in an attempt to enhance users' adherence to remote monitoring systems. We deploy WANDA-CVD, an RHM system for patients at risk of cardiovascular disease (CVD), using a wearable smartphone for detection of physical activity

III. PROPOSED SYSTEM

In this proposed work the vital parameters such as temperature, EEG and heart beat readings which are monitored using Arduino Uno. These sensors signals are send to Arduino Uno via amplifier circuit and signal conditioning unit (SCU), because the signals level are low (gain), so amplifier circuit is used to gain up the signals and transmit the signals to the Arduino Uno. Here patients body temperature , EEG and heart rate is measured using respective sensors and it can be monitored in the screen of computer using Arduino Uno connected to a cloud database system as well as monitored anywhere in the world using internet source.

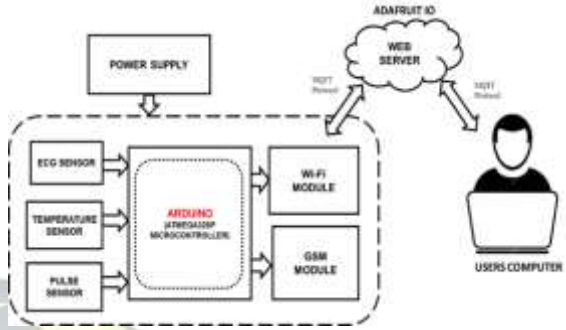

Fig.1 Proposed system block diagram

The proposed method of patient monitoring system monitors patient's health parameters using Arduino Uno. After connecting internet to the Arduinouno, it is connected to cloud database system which acts as a server. Then the server automatically sends data to the receiver system. Hence, it enables continuous monitoring of the patient's health parameters by the doctor. Any abrupt increase or decrease in these parameter values can be detected at the earliest and hence necessary medications can be implemented by the doctor immediately.

IV. COMPONENTS AND RESULTS

There are many types of power supply. Most are designed to convert the Voltage AC Mains electricity to a suitable low voltage supply for electronic Circuits and other Devices. A power supply can by broken down into a series of blocks, each of which performs a particular function. Here the AC supply main is given to the step down transformer. The transformer having the different voltages.

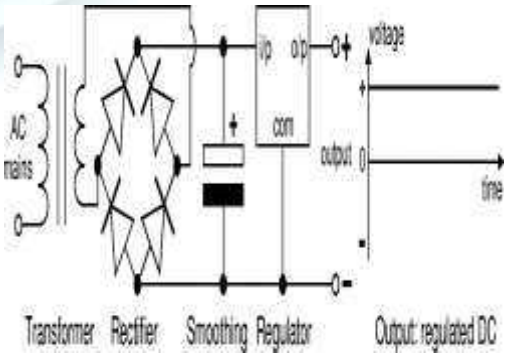

Fig.2 Rectifier Circuit Diagram and Waveform

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A. ARDUINO MICRO CONTROLLER

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board. The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board – you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

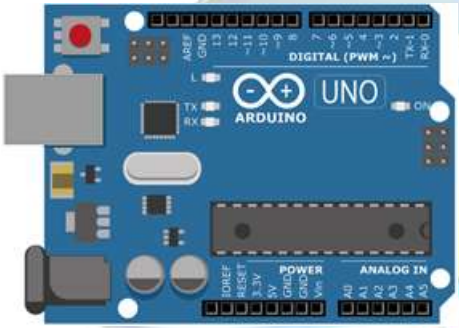

Fig.3 Arduino Board

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 powerit with a AC-to-DC adapter or battery to get started.

B. NODEMCU

The NodeMcu is an open-source firmware and development kit that helps you to Prototype your IOT product within a few Lua script lines.

Fig.4 NodeMcu

Features:

1. Open-source
2. Interactive
3. Programmable
4. Low cost
5. Simple
6. Smart
7. WI-FI enabled

Specification:

The Development Kit based on ESP8266, integrates GPIO, PWM, IIC, 1-Wire and ADC all in one board. Power your development in the fastest way combination with NodeMCU Firmware!

1. USB-TTL included, plug & play
2. 10 GPIO, every GPIO can be PWM, I2C, 1-wire
3. FCC CERTIFIED WI-FI module
4. PCB antenna

C. TEMPERATURE SENSORS

The most frequently measured environmental quantity is “Temperature” This might be expected since most of the systems are affected by temperature like physical, chemical, electronic, mechanical, and biological systems. Certain chemical effects, biological processes, and even electronic circuits execute best in limited temperature ranges. Temperature is one of the most frequently calculated variables and sensing can be made either through straight contact with the heating basis or remotely, without straight contact with the basis using radiated energy in its place. There is an ample variety of temperature sensor on the market today, including Thermocouples, Resistance Temperature Detectors (RTDs), Thermistors, Infrared, and Semiconductor Sensors. Usually, a temperature sensor is a thermocouple or a resistance temperature detector (RTD) that gathers the temperature from a specific source and alters the collected information into understandable type for an apparatus or an observer. Temperature sensors are used in several applications namely HV system and AC system environmental controls, medical devices, food processing units, chemical handling, controlling systems, automotive under the hood monitoring and etc.

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D. THERMISTORS

Thermistors are simple, inexpensive, and accurate components that make it easy to get temperature data. Thermistors are variable resistors that change their resistance with temperature. They are classified by the way their resistance responds to temperature changes. In Negative Temperature Coefficient (NTC) thermistors, resistance decreases with an increase in temperature. In Positive Temperature Coefficient (PTC) thermistors, resistance increases with an increase in temperature.

E. HEART BEAT SENSORS

A person's heartbeat is the sound of the valves in his/her's heart contracting or expanding as they force blood from one region to another. The number of times the heart beats per minute (BPM), is the heart beat rate and the beat of the heart that can be felt in any artery that lies close to the skin is the pulse.

Fig.5 Heart beat sensor

1) PRINCIPLE OF HEARTBEAT SENSOR

The heartbeat sensor is based on the principle of photo phlethysmography. It measures the change in volume of blood through any organ of the body which causes a change in the light intensity through that organ (a vascular region). In case of applications where heart pulse rate is to be monitored, the timing of the pulses is more important. The flow of blood volume is decided by the rate of heart pulses and since light is absorbed by blood, the signal pulses are equivalent to the heart beat pulses.
There are two types of photophlethysmography:

Transmission: Light emitted from the light emitting device is transmitted through any vascular region of the body like earlobe and received by the detector. Reflection: Light emitted from the light emitting device is reflected by the regions.

F. GLOBAL SYSTEM FOR MOBILE COMMUNICATION (GSM)

GSM is a mobile communication modem; it is stands for global system for mobile communication (GSM). The idea of GSM was developed at Bell Laboratories in 1970. It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands.GSM system was developed as a digital system using time division multiple access (TDMA) technique for communication purpose. A GSM digitizes and reduces the data, then sends it down through a channel with two different streams of client data, each in its own particular time slot. The digital system has an ability to carry 64 kbps to 120 Mbps of data rates.

1) GSM ARCHITECTURE

A GSM network consists of the following components:
A Mobile Station: It is the mobile phone which consists of the transceiver, the display and the processor and is controlled by a SIM card operating over the network.
Base Station Subsystem: It acts as an interface between the mobile station and the network subsystem. It consists of the Base Transceiver Station which contains the radio transceivers and handles the protocols for communication with mobiles. It also consists of the Base Station Controller which controls the Base Transceiver station and acts as a interface between the mobile station and mobile switching centre.

Network Subsystem: It provides the basic network connection to the mobile stations. The basic part of the Network Subsystem is the Mobile Service Switching Centre which provides access to different networks like ISDN, PSTN etc. It also consists of the Home Location Register and the Visitor Location Register which provides the call routing and roaming capabilities of GSM. It also contains the Equipment Identity Register which maintains an account of all the mobile equipments wherein each mobile is identified by its own IMEI number. IMEI stands for International Mobile Equipment Identity.
Features of GSM Module:

1. Improved spectrum efficiency
2. Real time clock with alarm management
3. High-quality speech
4. Short message service (SMS)

The security strategies standardized for the GSM system make it the most secure telecommunications standard currently accessible. Although the confidentiality of a call and secrecy of the GSM subscriber is just ensured on the radio channel, this is a major step in achieving end-to- end security.

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2) GSM MODEM

A GSM modem is a device which can be either a mobile phone or a modem device which can be used to make a computer or any other processor communicate over a network. A GSM modem requires a SIM card to be operated and operates over a network range subscribed by the network operator. It can be connected to a computer through serial, USB or Bluetooth connection.

Fig.6 GSM module

A GSM modem can also be a standard GSM mobile phone with the appropriate cable and software driver to connect to a serial port or USB port on your computer. GSM modem is usually preferable to a GSM mobile phone. The GSM modem has wide range of applications in transaction terminals, supply chain management, security applications, weather stations and GPRS mode remote data logging.

G. ARDUINO IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

1) SOFTWARE OVERVIEW

Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom right-hand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor. Versions of the Arduino Software (IDE) prior to 1.0 saved sketches with the extension .pde. It is possible to open these files with version 1.0, you will be prompted to save the sketch with the .ino extension on save.

H. HARDWARE VIEW

Fig.7 Hardware View

V. CONCLUSION

From this proposed system, it is conclude that Wireless sensor technology is emerging as a significant element of healthcare services. In this proposed system a mobile physiological monitoring system is presented, which is able to continuously monitor the patients heartbeat, blood pressure and other critical parameters in the hospital. The system is able to carry out a long-term monitoring on patients condition and is equipped with an emergency rescue mechanism using SMS.

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