IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A Novel Implementation Of Health Care Monitoring System Using Heartbeat And Temperature Sensors

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Abstract: In the last decade the healthcare has drawn considerable amount of attention since the traditional approach needed healthcare professionals must to present all the time and visit the patient's ward for necessary diagnosis and advising. In order to solve these problems, an efficient Healthcare monitoring system (HMS) is come into existence for comfort of people. An effective patient monitoring system should be able to display and transmit patients' critical physiological data to their healthcare service providers from anywhere at any time. Therefore a novel implementation of health care monitoring system using heartbeat, temperature is proposed. This system continuously monitors patient's health parameters such as heart beat and body temperature. It also monitors the saline level in a saline bottle connected to the patient. The heartbeat, temperature and saline level detection sensors are used in this system. Speaker is used to give an alert in all conditions when threshold values of sensors exceed through a predefined voice messages stored the speaker driver circuit. The total system is monitored by ARM-7. Global. System for Mobile Communication (GSM) and global positioning system (GPS) module can be used in all conditions to create message alert with location whenever patient sensor data is approaching to abnormality.

Index Terms **- ARM, Heartbeat sensor, temperature sensor, saline level detection sensor, 16X2 LCD display, Relay, Buzzer.**

I. INTRODUCTION

In the recent years of technology Internet of Things has brought an eventual growth in the approach of the modern procedures. Internet of Things can be used in monitoring patients health. The metabolism in patients health like temperature, body moment and heartbeat are monitored using IoT.

A Remote health monitoring system is an extension of a hospital medical system where a patient's vital body state is often monitored remotely. Traditionally the detection systems were only found in hospitals and were characterized by huge and sophisticated circuitry which required high power consumption. Continuous advances in the semiconductor technology industry have led to sensors and microcontrollers that are smaller in size, faster in operation, low in power consumption and affordable in cost [1]. The Internet of Things is considered now as one of the feasible solutions for any remote value tracking especially in the field of health monitoring. Internet of Things (IoT) development brings new opportunities in many applications, including smart cities and smart healthcare [2]. At present, the primary usage of the IoT in medical and healthcare can be categorized as remote monitoring and real-time health systems.

In the proposed system we present a health monitoring system that uses the sensors for collecting data from patients, intelligently predicts patient's health status and provides feedback to doctors through their mobile devices. ARM microcontroller is the heart of the system helps in transferring control signals to different devices in the system. The heartbeat, temperature and saline bottle level of patients are monitored through this system. Heartbeat sensor senses and detects the heart rate of patients whereas Temperature sensor monitors and detects the body temperature of patients. Saline level detection is used to detect the saline level of a bottle that is attached to the patients. Speaker is used to give an alert through a predefined voice messages stored in the speaker driver circuit. This system also provides a real time monitoring of patients health using GSM and GPS technologies. The 16X2 LCD display is used to continuously display the working of the system in each condition. Proposed system can provide automatic guidance to the patients. It can monitor patients all the time without the presence of human. It can also provide sufficient condition to patients regarding their issue. It also provides real time monitoring of patients with their location.

II. LITERATURE SURVEY

There are several research groups who are currently working on Wireless Health Monitoring systems across the world. The health care is one of the most important factors in today's life. The real time monitoring from a remote place is needed for the patients care in this fast moving world [3].

The author [Punit gupta et.al] "IOT based smart health care kit", It has suggested main idea of propose system is to provide better and health services to patients' by using microcontroller for implementing a networked information cloud so that the experts and doctor Could make use of this data and provides and efficient solution [4]. The author [D.Santi kumari, G.Indira devi et.al], "Design and implementation of health monitoring system by using RF communication" from above journal it can be concluded that the able to transmit the data which is sense from patients to doctor side by using GSM it is completely integrated so that is possible to track anytime and anywhere. It has real time capability[5].

Shrenik Suresh Saradeet. Al [6] proposed a venture having a easy, microcontroller primarily based heart beat fee & body temperature measuring device with display the information on LCD display. Heart fee of the concern/frame is measured from the index finger using IRD (Infra-Red Device) sensors. Also Saline Level is measured constantly for different tiers. The device alarms while the coronary heart beat & the frame temperature exceed the provided threshold price. This threshold value is described through the programmer on the time of programming of microcontroller. The threshold cost is as 20 to a hundred and twenty pulses in line with minute for coronary heart beat indication & 18°C to 38°C for temperature.

The author [Shahram jalaliniya et.al] "a wearable kids health monitoring system on smart phone" , the most important use case of the mobile application is connecting to the wearable device and collecting the physiological data. The user can search available devices and select a device to connect. In fact, this mobile application can collect data from all sensors supporting data transmission via Bluetooth. After connecting to the wearable device the body temperature and heart rate will be appeared on the screen and stored in a file on the Smartphone. It has suggested according to finding this kind of monitoring system not suitable for critical situation, but many students are suffering from chronic diseases & there family can benefit a lot from this system.[7]

Health Monitoring System, A health monitoring system consists of ECG, Pulse rate, SpO2, blood pressure, etc., These equipment are already available in commercial markets for the hospital setups and many researches are currently being held to improve the efficiency and accuracy. These equipment are massive in size that can be used only in hospitals and clinics and could not be used by the patients outside the hospitals. Since the production cost is high due to several factors, it is also expensive. Due to the above reasons, we started working towards the health monitoring system that is affordable and portable for patients to monitor their health outside the hospitals [8-10].

The proposed health monitoring system prototype would be the initiative to the health care sector to monitor the patient's health wirelessly and analyze it in a hospital environment, which avoids the situation for the patients to be present at the hospital each and every time for the check up and emergency.

III. PROPOSED SYSTEM

A novel implementation of health care monitoring system using heartbeat and temperature sensors is the proposed system. This system monitors patient's health continuously using an ARM controller. The below figure (1) shows the block diagram of proposed system.

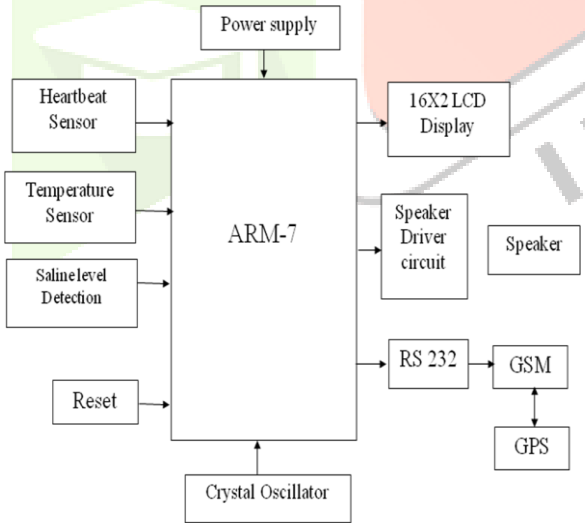

Fig. 1: PROPOSED SYSTEM

3.1 Crystal Oscillator

An oscillator gives a wellspring of tedious A.C. motion over its yield terminals without requiring any contribution (aside from a D.C. supply). The flag produced by the oscillator is more often than not of steady sufficiency. The wave shape and sufficiency are controlled by the plan of the oscillator circuit and decision of segment esteems. The recurrence of the yield wave might be fixed or variable, contingent upon the oscillator structure.

3.2 Power Supply

Power supplies in recent times have greatly improved in reliability but, because they have to handle considerably higher voltages and currents than any or most of the circuitry they supply, they are often the most susceptible to failure of any part of an electronic system. Modern power supplies have also increased greatly in their complexity, and can supply very stable output voltages controlled by feedback systems. Many power supply circuits also contain automatic safety circuits to prevent dangerous over voltage or over current situations.

3.3 LCD Display

LCD is used to display the data. 16x2 is the LCD that has been used i.e. 16 characters in 1 line, total 2 lines are there. It requires +5V to operate. It is connected to port 2 of microcontroller. It acts as an output to microcontroller. It uses ASCII values to display the character.

3.4 ARM

The LPC2148 microcontrollers are focused around a 16- bit or 32-bit ARM7TDMI-S CPU with constant imitating and implanted follow help, which consolidate microcontroller with inserted high velocity streak memory extending from 32 kb to 512 kb. A 128-bit wide memory interface and one of a kind quickening agent building design empower 32-bit code execution at the most extreme clock rate. Because of their little size and low power utilization, LPC2148 are perfect for applications where scaling down is a key prerequisite, for example, access control and purpose of-offer. Serial interchanges interfaces running from a USB 2.0 Full-speed gadget, various UARTS, SPI, SSP to I2c-transport and on chip SRAM of 8 kilo Bytes up to 40 Kilo Bytes, make these gadgets extremely appropriate for correspondence entryways and convention converters, delicate modems, voice distinguishment and low end imaging, giving both extensive cradle size and high transforming force. Different 32-bit clocks, single or double 10-bit ADC(s), 10-bit DAC, PWM channels and 45 quick GPIO lines with up to nine edge or level touchy outside intrude on pins make these microcontrollers suitable for mechanical control and restorative frameworks.

3.5 Heartbeat Sensor

The basic heartbeat sensor consists of a light emitting diode and a detector like a light detecting resistor or a photodiode. The heart beat pulses causes a variation in the flow of blood to different regions of the body. When a tissue is illuminated with the light source, i.e. light emitted by the led, it either reflects (a finger tissue) or transmits the light (earlobe). Some of the light is absorbed by the blood and the transmitted or the reflected light is received by the light detector. The amount of light absorbed depends on the blood volume in that tissue. The detector output is in form of electrical signal and is proportional to the heart beat rate

3.6 Temperature Sensor

LM35 is an analog, linear temperature sensor whose output voltage varies linearly with change in temperature. LM35 is three terminal linear temperature sensor from National semiconductors. It can measure temperature from-55 degree Celsius to +150 degree Celsius. The voltage output of the LM35 increases 10mV per degree Celsius rise in temperature. LM35 can be operated from a 5V supply and the stand by current is less than 60uA.

3.7 Saline Level Detection Sensor

This saline level sensor have 3 parts– first pin is input of voltage, another pin is ground and third one is analog input. Here by using a sensors, calculate the saline content of the saline bottle (volume %). To calculate percentage of the saline content, the value of analog is to be combining in the range of 0-100. The electrical resistance of saline is used in this sensor. And also have 2 analyses that allow permission transfer the power through the saline. Hence, when the increases the saline content then automatically increases the conduction of electricity and also at the same time decreases the resistance. The percentage of the saline is decreases when the saline is utilized; it tends to high in level of resistance. Here to calculate in saline level uses the properties of resistance by using a 2 various ways Analog and Digital mode are it could be combined.

3.8 GSM

Global System for Mobile Communications (GSM) modems are specialized types of modems that operate over subscription based wireless networks, similar to a mobile phone. A GSM modem accepts a Subscriber Identity Module (SIM) card, and basically acts like a mobile phone for a computer. Such a modem can even be a dedicated mobile phone that the computer uses for GSM network capabilities.

3.9 RS-232

RS-232 is a standard protocol used for serial communication, it is used for connecting computer and its peripheral devices to allow serial data exchange between them. As it obtains the voltage for the path used for the data exchange between the devices.

3.10 GPS

The Global Positioning System (GPS) is a U.S. space-based global navigation satellite system. It provides reliable positioning, navigation, and timing services to worldwide users on a continuous basis in all weather, day and night, anywhere on or near the Earth.

3.11 Speaker

Speakers operate by moving a mass of air in such a way that it creates audible sound. Typically, speakers convert electrical impulses into sound. All speakers are either passive or powered. Most speakers that are commercially available are passive. Passive speakers do not have a built-in amplifier and must be connected to an amplifier using a regular speaker wire.

IV. RESULTS

The following figure (2) shows the basic circuit schematic diagram of proposed system. It shows the crystal oscillator, Reset and LDD display connected to the ARM.

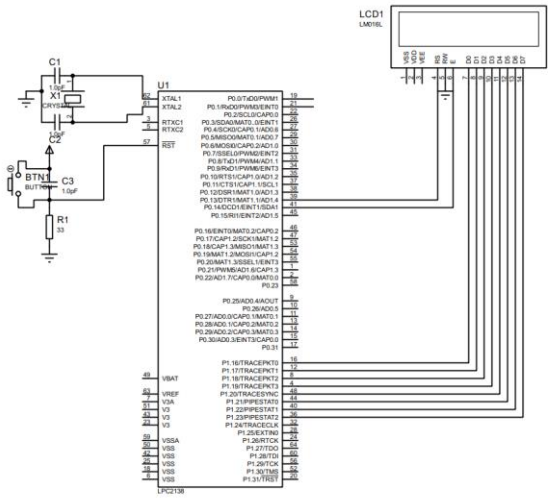

Fig. 2: BASIC CIRCUIT SCHEMATIC OF PROPOSED SYSTEM

The following figure (3) shows the complete circuit schematic of proposed system.

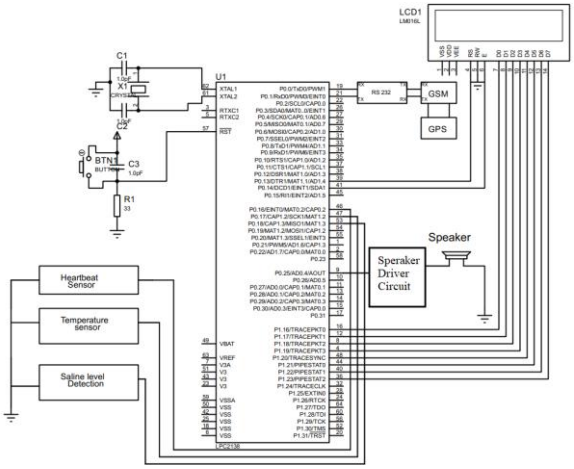

Fig. 3: COMPLETE CIRCUIT SCHEMATIC OF PROPOSED SYSTEM

The following figure (4) shows the complete experimental kit of proposed system.

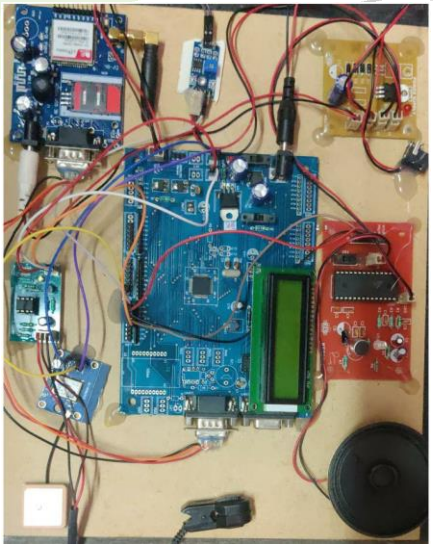

Fig. 4: EXPERIMENTAL KIT OF PROPOSED SYSTEM

The following figure (5) shows the output of proposed system. GSM and GPA are interfacing to the ARM processor. The RS232 is used to interface GSM to the ARM processor which is a serial connector that converts TTL logics into binary and vice versa. When the heartbeat sensor activated the speaker will be activated and give an alert notification through predefined voice commands. At the same time GSM will also be activated and the SMS can be sending to the respective person along with location using GPS. The same output was performed for the temperature and saline detection sensors also.

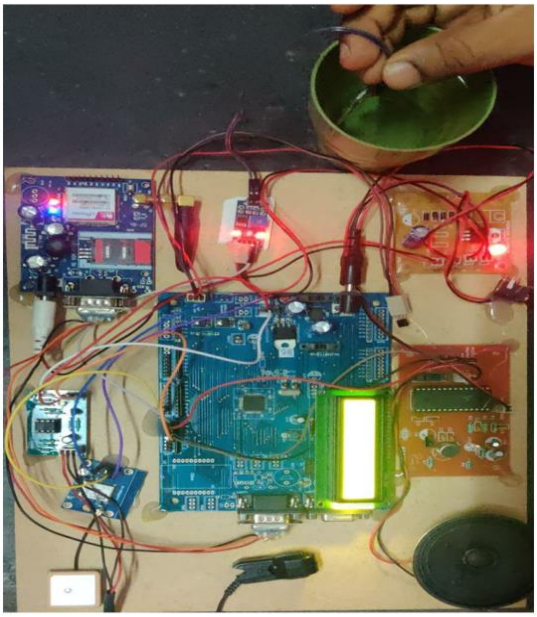

Fig.5: OUTPUT OF PROPOSED SYSTEM

VI.CONCLUSION

Employing embedded technology based on ARM LPC 2148 microcontroller, portable system is designed to implementation of temperature, heart rate and saline level detection sensor. The key objective of developing this module is to alert medical advisory about present health condition of patient via SMS and a voice message through speaker. The alert message in the form of voice with predefined information is coming from speaker when body temperature, heart rate and saline level exceeds or below the threshold level. It fulfills the objective to measure the heart rate, body temperature and saline level. With this system we can detect biological parameter of the body such as heart rate, temperature along with saline level of bottle. This module is advantageous where continuous monitoring of patient is required under critical condition. This module is applicable in Hospitals, homes and also in ambulances. But for this module, GSM modem requires postpaid SIM card. Message cannot be send to medical advisory without network coverage. The advantage of this system is portable mobility, compact, low power consumption, storing the database is very simple application. This system is very powerful tool for doctor and nurse.

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