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WIRELESS PATIENT AID ALERT SYSTEM USING MICROCONTROLLER

Mrs. J. GANGA DEVI [1], S.P.R. JEYA PRABHA [2], S. PETCHI RAMALAKSHMI [3], R. KEERTHIKA [4]

[1] Assistant Professor, ECE, Kamaraj College of Engineering and Technology, Virudhunagar.

[2,3,4] UG Student, ECE, Kamaraj College of Engineering and Technology, Virudhunagar.

I. ABSTRACT

Many countries face an ever-growing need to provide constant care and support for their disabled patient or elder people. Finding more effective ways to provide care or treatment for elderly and disabled people is necessary on each and every day. But it is not possible by manual inspection. Hence remote monitoring of a patient is the right solution. Since the mobile network is widely spread within rural and urban areas, this inspired to use the GSM module in this project. In this proposed method, the patient is regularly monitored by the temperature and heartbeat sensor which are interfaced with Arduino mega microcontroller. The moment the value crosses the normal range, a message is sent through GSM to the doctor and also to a relative. In addition to this, patient's information is stored using respective RFID tag. Using RFID reader, physician can get the data at any time. This project also focus on satisfying the needs requested by the patient or elder people with the help of the switches and GSM. By implementing this methodology, elder people or disabled patient get aided through wireless technology at a low cost.

Keywords: Heart beat, temperature sensors, Arduino Mega, GSM module, RFID tag with reader and switches.

II. INTRODUCTION

In recent years, lightweight devices have emerged as a viable alternative for continuous measurement of vital biomedical parameters. Wearable biosensors are connected to the patients that allows physicians to continuously monitor vital signs, and helps in preventing any critical mishap. This work focus is on the people (patients) who do not have any assistance at home particularly the elders who are totally on bed.

A regular and reliable assistive technology is needed while taking care of these patients. They face many problems regarding their critical health parameter variations and timely assistance in case of emergency. The device will continuously monitor the heart rate and temperature of the patient and if it exceeds the normal level, the device communicates with a mobile in which a customizable application is developed which will enable the alert mechanism. The communication between the device and the mobile is via GSM Module. Every patient is provided with a unique RFID number and all the details regarding the patient and treatments are stored using RFID Technology, which reduces the carrying load of the treatment details and the records. Sometimes patient will need any service at any time and their needs can be satisfied by providing switches to the patients. This will respond to the patient's requests. The major parts of this project are Heart Beat Sensor, Temperature Sensor LM35, Arduino Mega256, LCD, GSM Module, RFID Tag with reader and Switches. Inspecting patients on a regular basis is vital for their safety. Compared to the physical inspection, wireless monitoring offers continuous observation, reduced costs and increased security.

III. PROPOSED METHODOLOGY

The complete system can be divided into three subsections.

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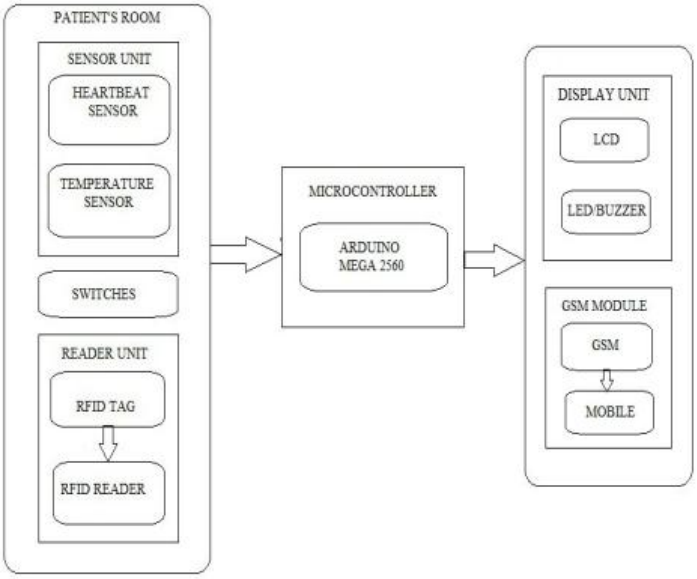
A. Measurement Unit

B. Service Provision Unit

C. Processing unit

D. Communication Unit

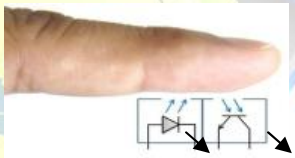


A. MEASUREMENT UNIT:

It consists of Heart Beat Sensor, Temperature sensor, RFID tag and reader.

Heart Beat Sensor:

For this work, we use TCRT1000, which is a reflective optical sensor having infrared light emitter and phototransistor placed side by side and are enclosed inside a leaded package, hence there is minimum effect of surrounding visible light. Christo Ananth et al. [6] discussed about an eye blinking sensor. Nowadays heart attack patients are increasing day by day."Though it is tough to save the heart attack patients, we can increase the statistics of saving the life of patients & the life of others whom they are responsible for. The main design of this project is to track the heart attack of patients who are suffering from any attacks during driving and send them a medical need & thereby to stop the vehicle to ensure that the persons along them are safe from accident. Here, an eye blinking sensor is used to sense the blinking of the eye. spO2 sensor checks the pulse rate of the patient. Both are connected to micro controller. If eye blinking gets stopped then the signal is sent to the controller to make an alarm through the buffer. If spO2 sensor senses a variation in pulse or low oxygen content in blood, it may results in heart failure and therefore the controller stops the motor of the vehicle. Then Tarang F4 transmitter is used to send the vehicle number & the mobile number of the patient to a nearest medical station within 25 km for medical aid. The pulse rate monitored via LCD .The Tarang F4 receiver receives the signal and passes through controller and the number gets displayed in the LCD screen and an alarm is produced through a buzzer as soon the signal is received.



LED

Phototransistor

Temperature sensor:

Temperature sensor, LM35 and TMP36 are both suitable for human body temperature measurement. However LM35 has been chosen due to higher accuracy and wider range from its counterpart. LM35, developed by Texas Instrument is an integrated-circuit temperature device working in wide range (-55 to +150°C).The output voltage also has linearly proportional to Celsius (Centigrade) temperature. The features of LM35 are low output impedance, calibrated directly in °Celsius (Centigrade) and linear + 10.0 mV/°C scale factor. It is also suitable for remote applications.

The voltage-temperature conversion basic formula for LM35 is given below,

Temp in °C = [V Out in mV] / 10

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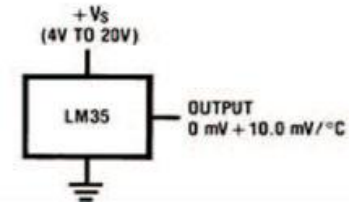
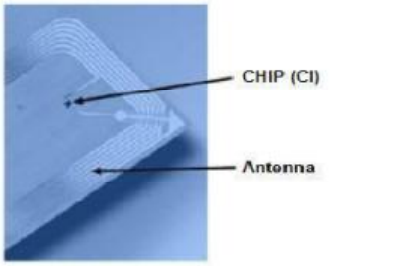


RFID tag:

RFID tags are small transponders that respond to queries from a reader by wirelessly transmitting a serial number or similar identifier. They are usually thought as an advanced barcode. RFID is the special type wireless card which has inbuilt the embedded chip along with loop antenna. The inbuilt embedded chip represents the 12 digit card number. RFID tags are classified into active or passive tags .Active RFID tags have their own power source, the reader can be much farther away and still get the signal, but they have limited life spans. Passive RFID tags do not require batteries and have a virtually unlimited life span.

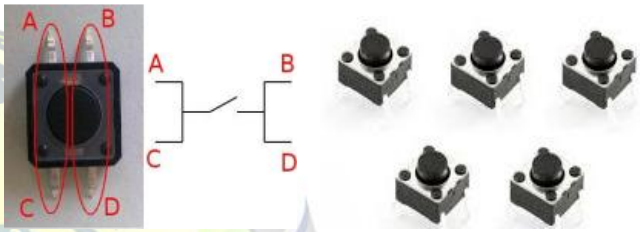


RFID reader:

An RFID reader is a device used to read the data's present in the RFID tag. RFID readers or interrogators are composed of a radio frequency module, a control unit and an antenna to interrogate electronic tags via radio frequency (RF) communication. Power supply is provided with 12v DC adapter and the current is less than 50mA. The operating frequency is 125 KHZ. The readable distance in RFID reader is 8to 10 cm.

B. SERVICE PROVISION UNIT:

This consists of Switches or Push buttons.



It is provided to the patients. A pushbutton is a simple switch mechanism which permits user generated changes in the state of a circuit. Pushbutton usually comes with four legs. When we don't push the button, the circuit is open and no current flows in it. When we push the button the circuit closes and current flows.

C. PROCESSING UNIT:

The processing unit consists of the Arduino Mega kit.

Arduino is open source software. The programming is done in C/C++ language. It has 54 digital input/output pins, 16 analog inputs, 4 UARTs, a 16 MHz crystal oscillator and a reset button. Microcontroller can simply

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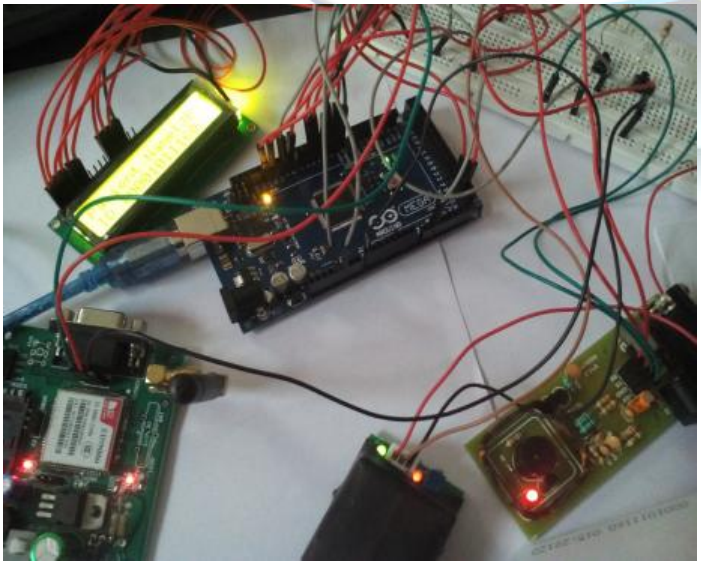
connect it to a computer with a USB cable or power it with an AC-to-DC adapter.

D. COMMUNICATION UNIT:

The communication unit consists of GSM Module and a Mobile phone.

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. Programming is done using AT commands. GSM module has a dedicated transmission & reception pin which are connected to Arduino Mega. It works on 12Vdc supply. From the mobile operator perspective, a GSM modem looks just like a mobile phone. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it may be a mobile phone that provides GSM modem capabilities.

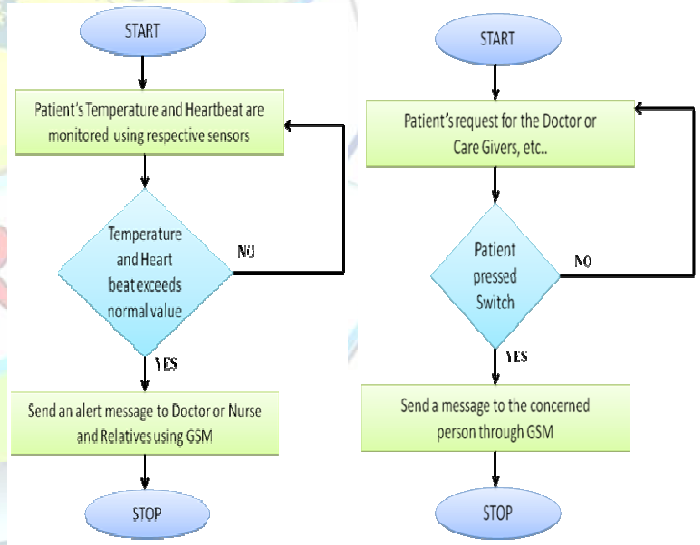
IV. HARDWARE IMPLEMENTATION



The heart beat sensor, temperature sensor, switches, RFID reader & GSM module are interfaced with Arduino Microcontroller. The digital output is directly attached to digital I/O pin. Arduino Mega board has been connected to transmission & reception pin of GSM module and RFID reader. It also provides information to LCD, which displays corresponding patient ID, heart rate and temperature values and buzzers or LEDs to indicate. RFID reader reads the patient's information from tag and passes it to Arduino.

Working:

Temperature sensor continuously checks the temperature level of the patient. Heartbeat sensor checks the heartbeats of the patient. If the values exceed the normal value, then an alert message is sent to the doctor and relatives using GSM Modem.



Patients can also call particular resource people such as care givers, etc. by pressing the corresponding switches. On pressing, the information will be processed by microcontroller and a message will be sent to the respective resource people through GSM, which is also indicated by LCD and LEDs or buzzers for elder people in their home.

V. RESULT

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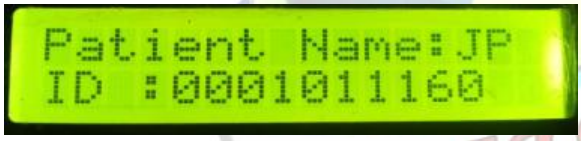
The heart rate and body temperature are measured, and SMS is sent to the Concern person during emergency time using GSM. The measurement result is shown in below segment.

Measured Results:

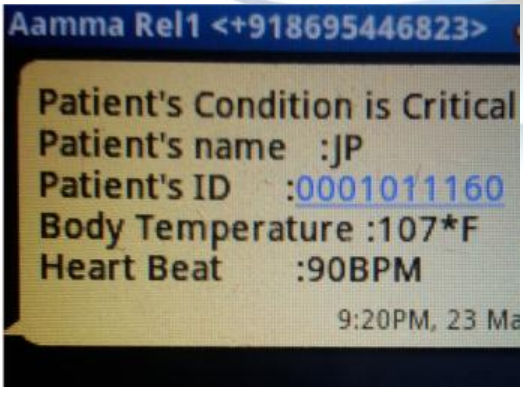
Normal value of patient's body temperature and heart beat measured from the sensors.

Patient's body temperature and heart beat value exceeding normal value.

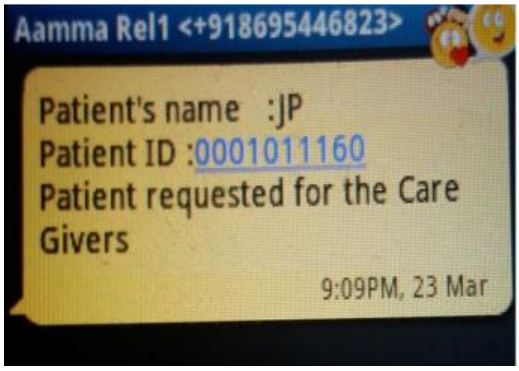
Patient's detail using RFID tag and reader.



SMS sent to the doctor during emergency condition with patient's details.



SMS sent to the caregivers with patient details when the patient request for care givers by pressing switch.



VI. CONCLUSION

Providing quality and timely health assistance for elderly people is a growing concern of both developed and developing nations. Though there are high-tech hospitals and care centers for elderly, fact that majority of them suffer from chronic disease and they require continuous monitoring of their physical parameters make it quiet expensive. Moreover majority of the elderly people prefer to be at home, where they are not attached with the family and society. In such a scenario, the algorithm implemented in this project could be very effective. Heart rate and body temperature measurement for remote health monitoring has been designed and developed. This work also reduces the procedure of carrying the bulk of papers and records during every visit of the patient by the doctors. This system provides the reliable measurements and very user friendly. It can work independently at a home environment. Thus this device can really be a boon to elderly society by assisting them in getting quality assistance at their own houses with the help of wireless technology.

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