

Motion Based Message Conveyor for Paralytic/Disabled People

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Abstract - This paper gives us the development of a microcontroller chip based system for heartbeat, stress and temperature monitoring using Bluetooth module and mobile app. By this we can easily monitor the patient's status by using Bluetooth model and can send them SMS alert in critical conditions. In India many paralytic or disabled patients are dying because of heart attacks and reason behind this factor is that they are not getting proper help during the period. In order to assist them in a timely and appropriate manner, we would like to continuously monitor the health of patients. The fixed monitoring system can only be used when the patient is in bed. These systems are huge and are only available in intensive care hospitals. The system was developed for home use by patients who are not in critical condition but need to be monitored by a doctor or family in good time. In each critical condition, the SMS is sent to the doctor or a family member. So that we can easily save many lives by providing fast service.

Keywords: Accelerometer, Microcontroller, Patient communication, Sensors.

I. INTRODUCTION

Among the many advances in the medical field, very few are aimed at helping disabled patients to communicate. Although monitoring systems make it easier for doctors to record and monitor a patient's vital signs, there are not many options for actual verbal communication for disabled patients. The main goal is to replace the traditional patient-nurse communication approach with modern technologies that provide a much faster and more reliable way of doing this. In the current scenario, the patient must depend on a family member, or mainly a room boy, both of whom have to care for the patient constantly [1]. Our goal is to make these patients independent in order to communicate with the nurse simply by tilting a device that is on their finger or on another mobile part of the body. This not only helps the patient, but also makes the job of the nurse easier. Since only one nurse is responsible for a certain number of patients, this saves the time it takes for each nurse to visit each patient to meet their needs. Once the

patient has sent the message, the nurse can remotely monitor their requests and provide help right away. All these ideas put together therefore focus on building an intelligent system to empower patients and at the same time support nurses [2].

Various biomedical sensors such as the temperature sensor, the heart rate sensor and the stress sensor are used to design the system based on these performances. This would save patients from the future health problem that would arise. It would also help the patient's doctor to take appropriate action at the right time.

II. LITERATURE SURVEY

We studied the papers related to our project topic. We got the information about different topic which is being related to our topic. Some of the topics are as follows:

First paper is "zigbee based centralized patient monitoring system" which is developed by sakshisharma and Rashmi Vashisth in 2015. The main objective of this paper is to make centralized patient monitoring system. Zigbee is wireless transmission technology is adopted. This paper is divided into two sections [3]. In the first section, we have patient monitoring of several patients, whereby several physiological parameters are measured on the respective unit and these values are displayed on the LCD screen of each patient unit. In the second section, a central patient monitoring system is created in which all patients are displayed with several parameters with the MATLAB software on the central monitor.

Second paper is "Real Time Health Monitoring System using Arduino" which is developed by Rajlakshmi S.S. Nikilla in 2016. This system is used to measure the physical parameters like temperature, heart beat rate and oxygen level monitoring with the help of biosensors. In this system arduino is used at transmitter and receiver side [4]. The direct communication patient and Doctor or nurse can be established by sending a message based on motion. The main part of the system is Arduinio uno. In that zigbee module is used for transmission and reception of signal and physical parameters of the patient can be measured.

Third paper is “Hand gesture recognition application for physically disabled people” which is developed by D.Vishnu Vardhan and P.Penchala Prasad in 2018 [5]. In this article, the recognition of hand gestures has been fully explained. Gesture recognition takes place using a sensor glove, consisting of five acceleration sensors and a microcontroller. Five acceleration sensors were used on each finger of the glove. The acceleration of the hand movement in three vertical directions is recorded by accelerometers and the acceleration values have been transmitted to the microcontroller.

III. PROPOSED METHODOLOGY AND DISCUSSION

To overcome the drawback of conventional system we purpose a system which consists of accelerometer, biomedical sensors like temperature sensor, heartbeat sensor and stress sensor. For displaying output or result OLED display is used. The accelerometer is capable of measuring the acceleration due to gravity and thus finding the angle at which the device is tilted with respect to the earth [6]. Whenever patient needs any help he or she tilts the accelerometer in different directions. The output of accelerometer depends on tilt angles and these values are read by atmega328 chip. These directions can be easily understood and used by any person using his/her thumb or any part of the body capable of moving in these directions.

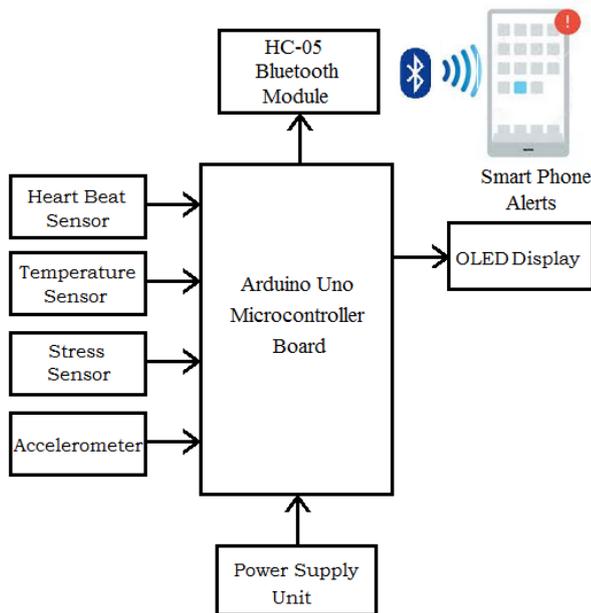


Figure 1: Proposed System Block Diagram

A predefined message will be stored in particular ranges assigned to a particular direction mentioned above. For example: food message will displayed when the person tilt the accelerometer into right direction. Such messages will be assigned to the particular direction like left, forward, backward direction. Values are assigned to each direction

according to that controller identifies the direction in which accelerometer is tilted. Furthermore temperature sensor, heart beat sensor and stress sensor are used to detect the temperature, stress and pulse rate of person [7]. After detection of these physical parameters it will be displayed on OLED display. If any parameter from the mentioned above crosses its predefined value or threshold value the SMS alert is send to the patient’s relative or Doctor’s phone number.

To monitor the patient’s health status we have also designed a mobile APP.HC-05 Bluetooth model is used for serial communication purpose. For displaying the physical parameters and conditions associated with the accelerometer. The mobile’s Bluetooth should be paired with the HC-05 Bluetooth model. APP also provides Text-to-Speech feature. This system will help to Nurse or Doctor to take care of each patient [8].

IV. HARDWARE USED

4.1 Atmega328p

It is 28 pin microcontroller chip. For minimizing size of hardware microcontroller chip is used instead of microcontroller. As well there GND, VCC, reset pin available in this IC.

4.2 Hc-05 Bluetooth model

The Bluetooth serial module is used to convert the serial interface to Bluetooth. These modules have two modes: master device and slave device.

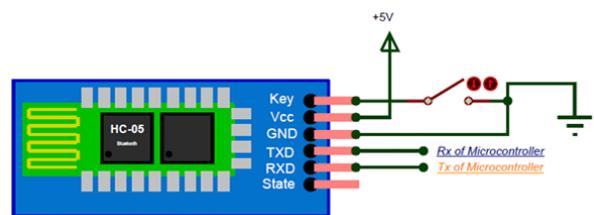


Figure 2: HC-05 Bluetooth Module Interface

The device named after an even number is defined as master or slave at the factory and cannot be changed for the other mode. For the device named after an odd number, users can define the operating mode (master or slave) of the device via the AT commands.

HC-04 specifically contains:

- Main unit: HC-04-M, M = master
- Slave device: HC-04-S, S = slave
- The standard situation of the HC-04 is slave mode. If you need master mode, please state it clearly or order

HC-04-M directly. The HC-06 naming rule is the same.

- If HC-03 and HC-05 are not ex-works, some of the device activation parameters are defined. The operating mode is not defined, because the user can set the mode of HC-03, HC-05 at will.
- It is serial to serial communication Bluetooth model. Range of this Bluetooth model is 10m-30m.

4.3 Heartbeat sensor

Heartbeat sensor consists of LDR and LED. We use pot of 10k to vary or set the frequency. LM358 IC used in heartbeat sensor which consists of (two 10k registers or 22k one register and capacitor). 100k register is used for indication whether heartbeat is sense or not. When heartbeats then blood will pump then LED's light will less fall on LDR.

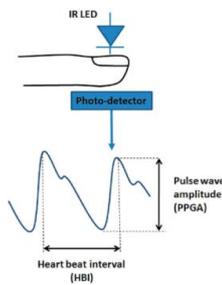


Figure 3: Heart Beat Detection and Photoplethysmography waveform using IR Sensor

When heart expands then LED's light will more fall on LDR. So according to this light intensity will changes. Heartbeats blood will pump out so LDR resistance increases so that junction we get rising voltage and vice versa. Whenever heartbeat we get on minute pulse so will give op-amp for amplify. For heartbeat sensor, 10 sec sampling should be done. Here we count that how many pulse coming in 10 sec.

4.4 Temperature sensor

For measuring temperature we are using Thermistor it is resistive element i.e. 10kΩ NTC. NTC is negative temperature coefficient which means that resistance decreases as temperature increases.

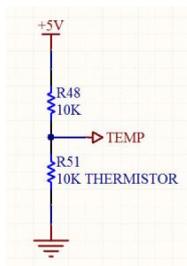


Figure 4: Body temperature Measurement using Thermistor

But here we want change in voltage but we get change in resistance. so one more resistor is added, this will form a potential divider. Both resistors are connected in series then supply voltage becomes half of actual supply.

4.5 Accelerometer

The ADXL335 is a triaxial MEMS accelerometer with extremely low noise and an energy consumption of only 320uA. The sensor has a full detection range of +/- 3 g.

The ADXL335 is a 3-axis analog accelerometer. Basically, this gizmo can measure the speed of movement, also known as force G, in three directions: up / down (z), forward / backward (x) and laterally (y). The directions of the axes change depending on how we position the IC sensor [9].

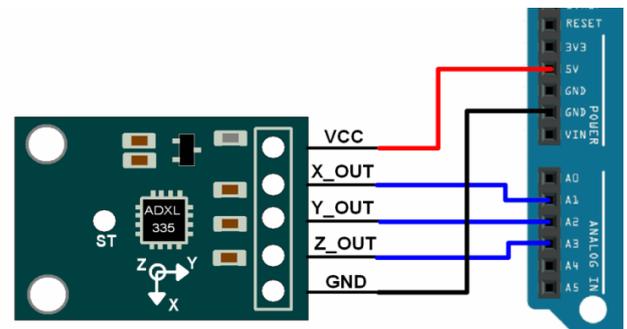


Figure 5: ADXL335 Accelerometer Pin and Arduino Interface

The ADXL335 has a measurement range of at least ± 3 g for each axis. When you stand still, the earth exerts a gravitational force of 1 g. This sensor emits signals in the form of voltage variations in the range from 0 to 3.3 V. In zero gravity, the voltage value of pin Z is exactly in the middle between 0 V and 3.3 V = 1.65 V.

The accelerometer can measure static gravitational acceleration (1 g) as well as tilt detection applications as well as dynamic acceleration due to movement, shock or vibration. The axis indicated by the ADXL335 1g depends on how you position the chip.

This special ADXL335 card must be powered by a 3.3 V source. It is also configured to provide updates 50 times per second. That's a lot of resolution for our road condition detection device.

Since the Arduino Uno can handle the reading of 3.3 V signals without conversion, we can directly use the output pins X, Y and Z of the ADXL335 (3.3 V) with the analog input pins Arduino (5 V) Connect Uno.

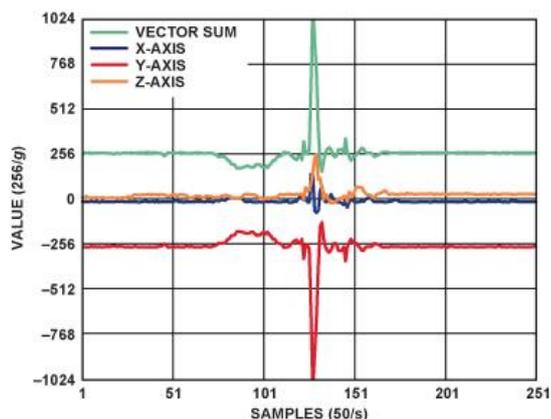


Figure 6: Position and Fall Detection using Accelerometer

Here ADXL-335 accelerometer is used to monitor the 3-axis movement of the person. This is used to sense the body position of the person by detecting the axial position. Conditions like fainting and falling down can be detected by measuring the axial position using this accelerometer.

4.6 Stress sensor

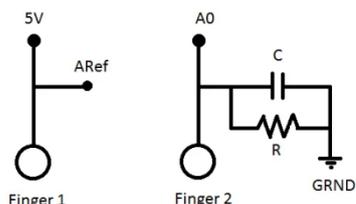


Figure 7: Stress Measurement using Galvanic Skin Resistance

We are measuring person's stress in percentage. Stress sensor consists of two electrodes. Normal human skin is dry but when person is tense then there is perspiration. So because of perspiration resistance of skin gets drop then current automatically increases, therefore built in voltage would be generated. We normally called it as stress and in medical terms it called as 'Galvanic Skin Resistance'.

4.7 OLED display

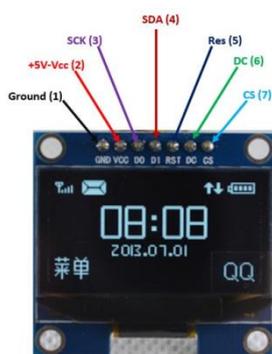


Figure 8: OLED Pin Configurations

OLED stands for organic light emitting diode. Its size is very small as compared to LCD. Light emitting technology involves in OLED display. It consists of thin organic material which is placed between anode and cathode. Biomedical parameters like heartbeat, temperature and stress will be displayed on OLED. 0.96 inch display used in our project.

V. OUTCOME OF PROJECT

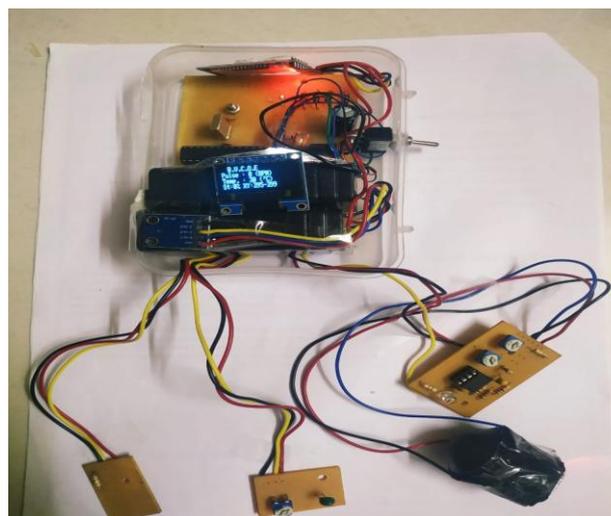


Figure 9: Prototype of Proposed Hardware

The hardware model of the proposed system is build using Atmega 328p microcontroller in which all the bio-sensors like temperature sensor, heart beat sensor, accelerometer are connected. Data from the hardware unit is transmitted using the HC-05 Bluetooth module. The output of the hardware is monitored and observed using Bluetooth Application in the android mobile device through which the vital signs of the patients are measured and monitored in real time.

VI. CONCLUSION

As motion based message conveyor system design is based on the idea that meet patients need. So just tilting the accelerometer to different direction they can easily communicate with the nurse or Doctor. So that paralytic and disabled people doesn't need to depend on other persons or relative for any kind of help.

Biomedical sensors are used to detect various physical parameters like heartbeat, temperature, stress. If one of this parameters from mentioned above crosses the threshold value then in such critical condition SMS alert will be send to the patient's relative or Doctor or the phone number that would be entered during programming. These parameters are also displayed on OLED display. By designing an app we can also monitor patients daily status and it will beneficial to Doctor or nurse to monitor each and every patient.

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