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Health Vigil System Using Arduino Uno via Bluetooth

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ABSTRACT: This paper describes about the design of simple heart rate monitor system based on arduino board which displays the output on a LCD display and simultaneously transmitting the data to a smart phone via Bluetooth. There is often a need to access heart rate measuring instrument which provide accurate and quick readings of patients. Unlike the conventional method, the doctor doesn't need to be present at the time of measuring the heart rate, blood pressure and body temperature. The system takes the physical input from pulse sensor by placing the patients' finger on the sensor and then the input is processed by arduino to count the no. of pulses and displaying the output.

KEYWORDS: arduino board, smart phone, heart rate, body temperature, from pulse sensor.

I. INTRODUCTION

Now, recently wireless sensor networks (WSN) play a vital role in the research, technological community hence resulting in the development of various high-performance smart sensing system. Many new research is focused at improving quality of human life in terms of health by designing and fabricating sensors which are either in direct contact with the human body (invasive) or indirectly (noninvasive) in contact.

Health monitoring is an informal, non-statutory method of surveying your workforce for symptoms of ill health, including lower back pain. This type of occupational health management system can enable you, as an employer, to be aware of health problems and intervene to prevent problems being caused or made worse by work activities. Another important role of health monitoring is to give feedback into a system that reviews the current control methods in place.

Nowadays, people suffering from heart diseases are increasing day by day. So, here a need arises to design a compatible system that would give us the accurate and quick heart rate readings. The readings are transmitted to the connected smart phone via Bluetooth i.e. through a wireless media.

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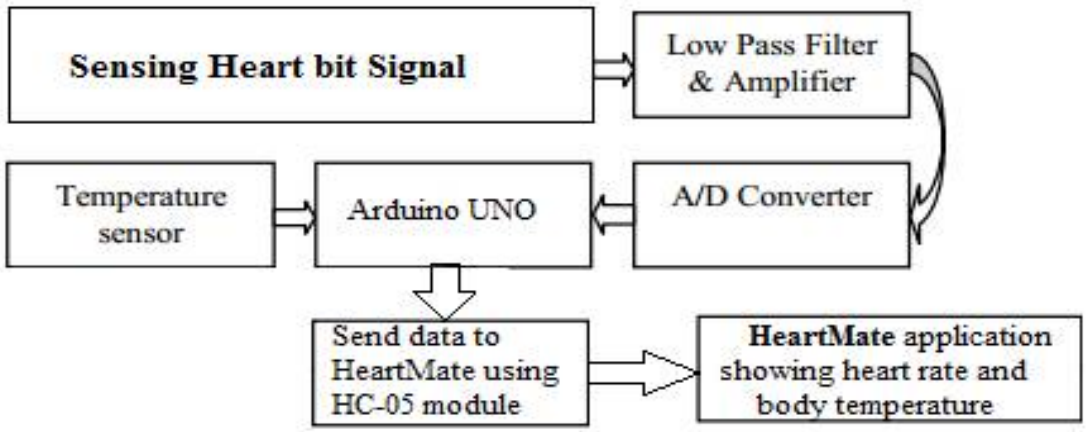

Fig 1.1: Block diagram of health monitoring system

Conventional heart rate measuring devices were employed with the chest straps to be attached with the patients' body. Such devices require a user to press a key when to check the heart rate, thus it is desirable to provide a reliable wireless heart rate monitor. In the proposed system, there is neither need to press any key nor attach any chest straps, user just has to place his finger on the sensor or wear the sensor on the ear lobe.

The sensor simply senses the pulses and displays on the LCD and also on the PC connected simultaneously sending the data to the configured smart phone via Bluetooth (also with some other wireless medium of transmission).

II. SPECIFICATION OF COMPONENTS

Hardware Components

- Bluetooth HC-05, 5V
- LCD 3.3V with 16 pins
- Pulse sensor is capable of 3V and it can work up to 5V, it has IR transmitter and photo diode
- Temperature sensor, 3.3V max:160°C, min: -50° C

Software Components

- Arduino UNO
- SPP Pro App

Hardware:

Any microcontroller based board which follows the standard Arduino schematic and is flashed with the Arduino boot loader can be called an Arduino board. The Arduino is referred to as open source hardware, since the standard schematic is open to everyone and anybody can make their own version of Arduino board following the standard schematic.

Arduino is a single board microcontroller, intended to make the application of interactive objects or environments more accessible. The hardware consists of an open source hardware board designed around an 8-bit Atmel AVR microcontroller, or a 32-bit Atmel ARM. Pre-programmed into the on-board microcontroller chip is a boot-loader that allows uploading programs into the microcontroller memory without needing a chip /device programmer.

Arduino started in 2005 as a project for students at the Interaction Design Institute Ivrea in Italy. The core Arduino developer team is composed of Massimo Banzi, David Cuartielles, and David Mellis. Arduino family consists of UNO, LILYPAD, DIECIMILA, NANO, and DUEMILANOVE.

An Arduino board consists of an Atmel 8-bit microcontroller with complementary components to facilitate programming and incorporation into other circuits. Official Arduino have used the mega AVR series of chips,

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specifically the ATmega8, ATmega168, ATmega328, ATmega1280, and ATmega2560. Most boards include a 5 volt linear regulator and a 16 MHz crystal oscillator or ceramic resonator in some variants.

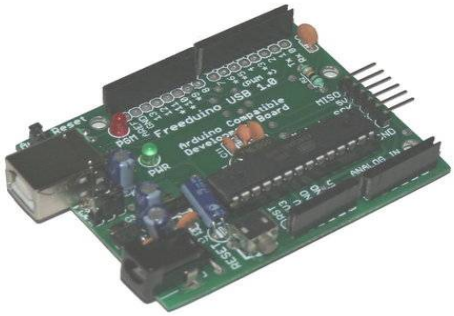

Fig 1: Arduino Board

Pin Description:

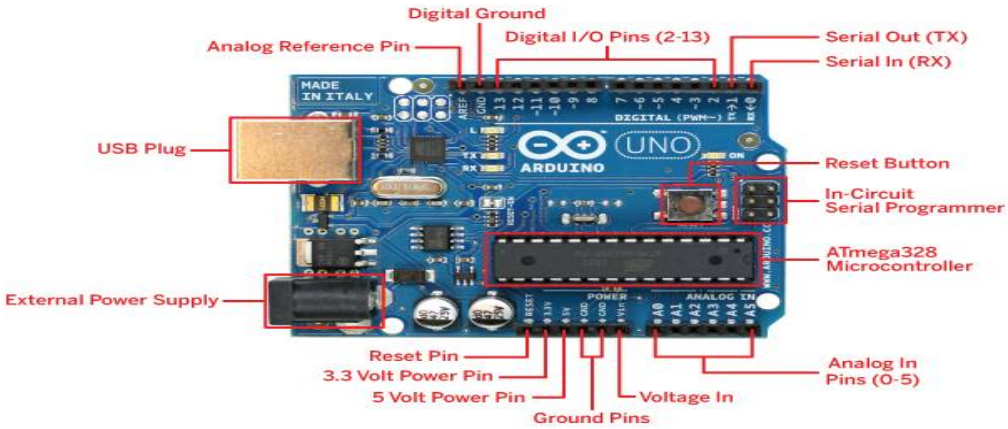

Fig2: Arduino Board representing all Components

LCD Panel:

A liquid-crystal display (LCD) is a flat-panel display or other electronic visual display that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly.

LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

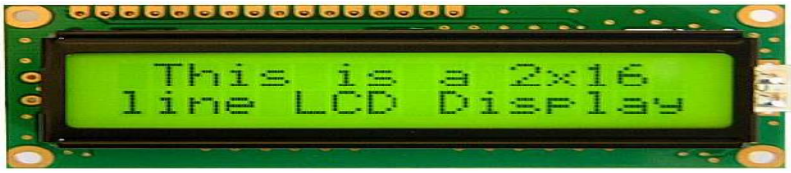

Fig 3: LCD

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Bluetooth Module HC-05

The Bluetooth module HC-05 is a MASTER/SLAVE module. By default the factory setting is SLAVE.

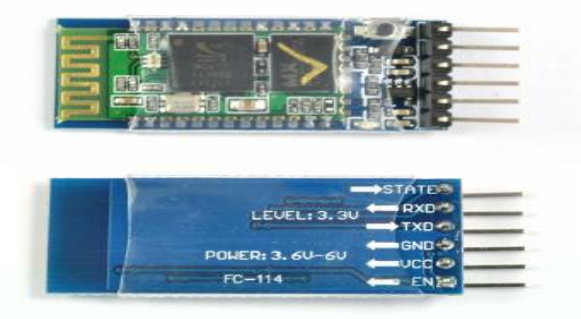

Fig 4: Bluetooth (HC-05)

The Bluetooth module HC-05 is a MASTER/SLAVE module. By default the factory setting is SLAVE. The Role of the module (Master or Slave) can be configured only by AT COMMANDS. The slave modules cannot initiate a connection to another Bluetooth device, but can accept connections. Master module can initiate a connection to other devices. The user can use it simply for a serial port replacement to establish connection between MCU and GPS, PC to your embedded project, etc.

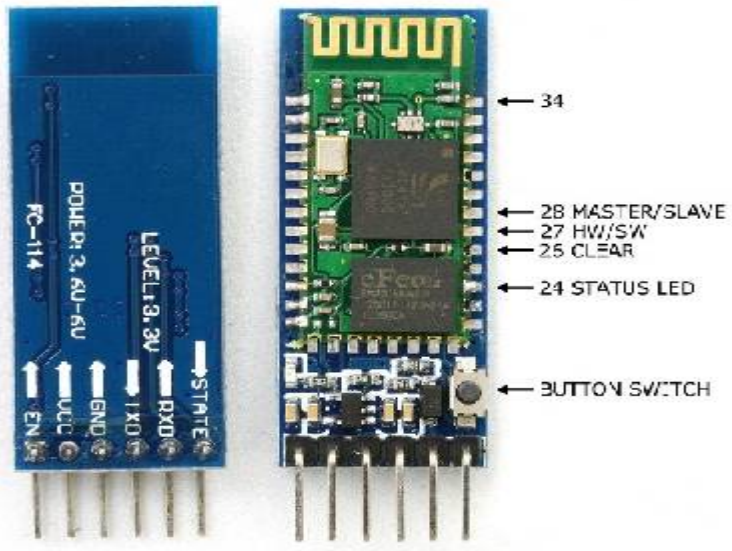

Fig 5: Description of pins in Bluetooth

Pulse Sensor:

Pulse Sensor is a well-designed plug-and-play heart-rate sensor for Arduino. It can be used by students, artists, athletes, makers, and game & mobile developers who want to easily incorporate live heart-rate data into their projects. The sensor clips onto a fingertip or earlobe and plugs right into Arduino. It also includes an open-source monitoring app that graphs your pulse in real time.

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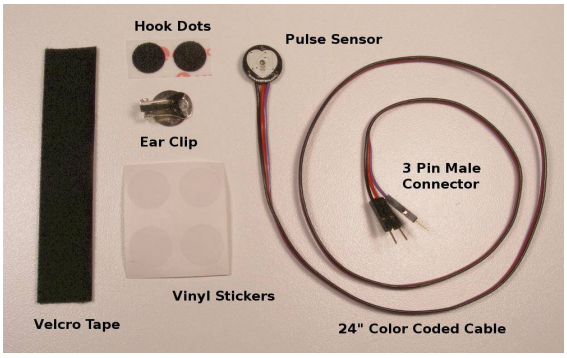

Fig 6: Kit of pulse sensor

Fig 7: Pulse sensor

III. PROCESSING

Software:

Make sure you are plugged into an Arduino board, that it is working correctly, and running our firmware. Check to see if you have the right serial port. The code underlined in red should match the correct port number in the terminal window at the bottom of Processing IDE.

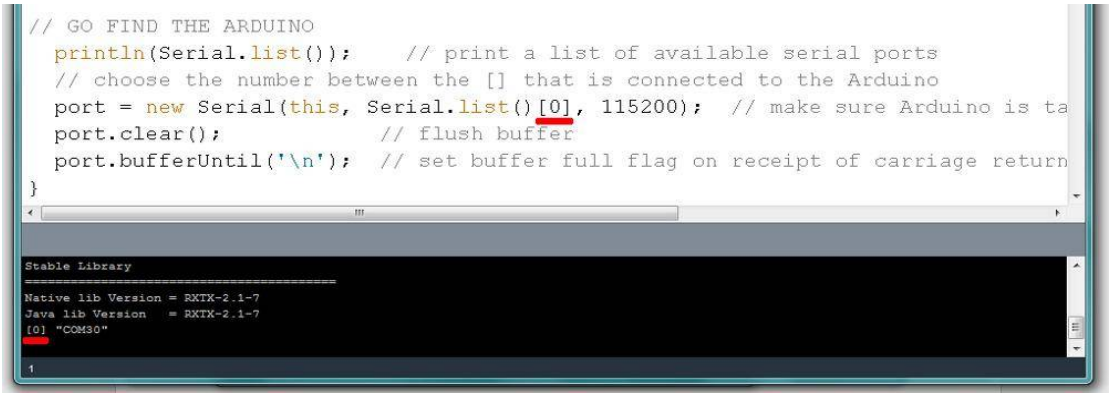

Fig 8: Compiling the Code

Showing the Pulse Rate

Make sure you have all your connections correct, and that you're not squeezing too hard on the Pulse Sensor. If you see a waveform that looks something like this, then you may get better results by powering the Pulse Sensor with 3.3V. Here's a simple test and fix to get you on your way. First, unplug the RED wire from the 5V pin, and plug it into the 3.3V pin as shown here.

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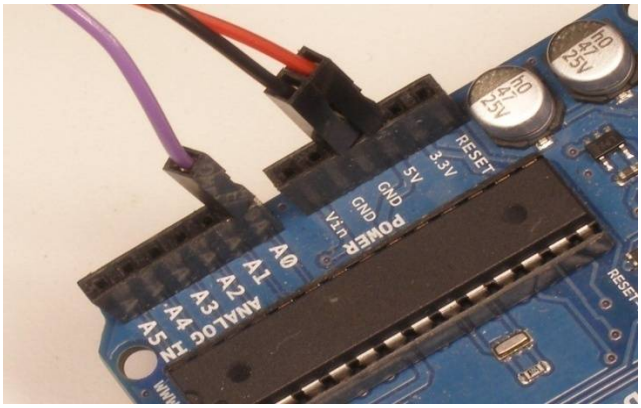

Fig 9 : Connection of Wires to Arduino board

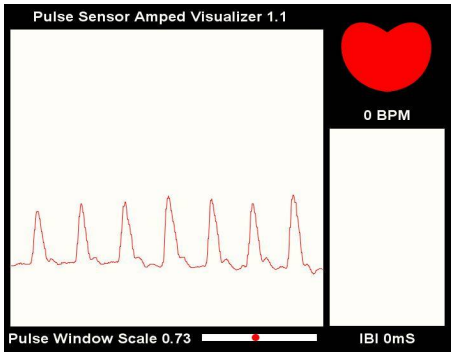

Fig 10: Pulse on Scale

LM35

Precision Centigrade Temperature Sensors

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 subtract a 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.

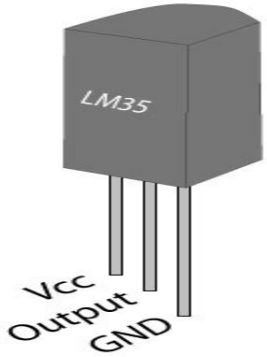

Fig 11: Temperature Sensor

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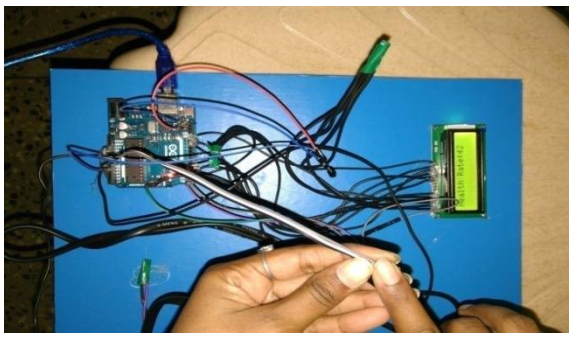
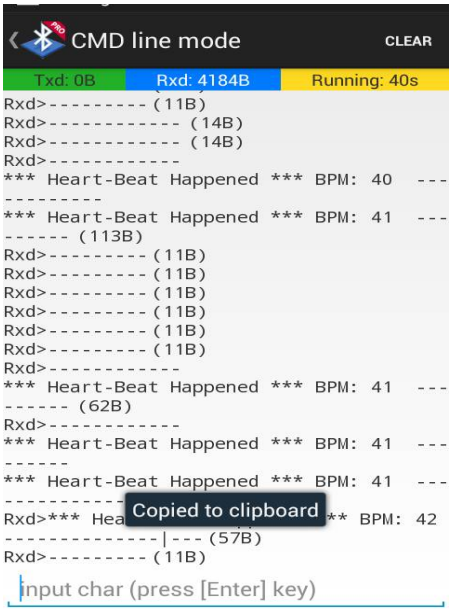
Results: Using Proteus software the temperature rate and heart beat rate is measured by sensing the information.At normal condition, no indication will be produced. At abnormal condition, indication will beproduced either by buzzer alert or cooling fan. If the temperature rate is upto 370C the result will be at normalstate. Then if the temperature exceeds above or falls below 370C the cooling fan starts to rotate. If the heart beatrate is upto 60-100 beats /min the result will be at normal state. Then if the heart rate exceeds above 100beats/min or falls below 60 beats/min the cooling fan starts to rotate.





IV. CONCLUSION

The progress in bio medical engineering, science and technology paved way for new inventions and technologies. As we are moving towards miniaturization, handy electronic components are in need. New products and new technology are being invented. ARDUINO was found to be more compact, user friendly and less complex, which could readily be used in order to perform several tedious and repetitive tasks. Simulation is performed using Proteus software by placing appropriate sensors like temperature and heart beat rate for sensing the health condition and the results are analyzed under normal conditions and abnormality conditions.

V. FUTURE SCOPE

Real time heath monitoring system using ARDUINO can be implemented in hardware using different types of sensors to detect the health conditions of the patients in critical sites continuous monitoring of health can be made and the data's will be stored in database. In future, a portable health monitoring system can be designed using Arduino.

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