International Journal of Engineering Research and Technology. ISSN 0974-3154, Volume 12, Number 2 (2019), pp. 255-259

Patient Tracking System

[1]Yahya S. H. Khraisat [2]Ahmad Al – Ahmadi; [3]Huthaifa Al - Issa

[1, 2] Department of Electrical Engineering, Faculty of Engineering, Taif University, KSA.

[3] Electrical and Electronics Engineering Department,
Al-Balqa Applied University/Al-Huson University College Irbid, Jordan.

Abstract

The primary function of this system is to monitor the temperature and heart beat of the patient. The Data collected by the sensors are sent to the Microcontroller. The Microcontroller transmits the data over the air by using the GSM modem from the transmitter to recording system in the receiving end. The information is sent as an SMS to the care monitoring system or to the experts to take action. Not only we send the information through GSM module as SMS we also display the readings on LCD. When the conditions go abnormal then sensors sense those values and then alarm around by blowing the alarm and also sending an emergency SMS to the desired destination.

Keywords— Monitoring System; PIC Microcontroller; GSM Modem; Patient tracking.

I. INTRODUCTION

It's clear that technology affects all aspects of our life and the medical field is not exception. So we need a well-equipped hospitals and diagnostic centers as the people are becoming more care and attention about their health. Because of the needs of life, people have to work more than 10 hours daily. Also the increasing in population results in increasing pollution which affected our daily life. There is large number of vehicles and undisciplined traffic which results in increasing the number of accidents every day. So there is a need for the well equipped hospitals and diagnostic centers. The today's hospitals are huge, with large areas in a building. Different wards are situated at different places such as men's wards, women's wards, maternity wards, general wards, special rooms, and more importantly intensive care doctors need to keep monitoring all the patients in these wards continuously, and this requires more number of skilled nurses and other concerned employees. It is not feasible for the doctors to go to each ward and monitor each patient frequently say after each half an hour. Keeping all these aspects in the mind we have developed wireless biomedical parameter monitoring system which can be used efficiently to get rid of the problems previously mentioned. In this system we continuously monitored the patient's health by different parameters such as body temperature and pulse heart rate. The collected data are transmitted to the control room continuously.

II. SYSTEM DESIGN

Our proposed system consists of the following blocks:

1. Microcontroller based control unit with regulated power supply
2. Heart Beat Sensor
3. Temperature sensor
4. GSM Modem (sim300 unit)
5. LCD Display

The architecture of the system consists of both hardware and software. Block diagram is shown in Figure1. Hardware components were assembled according to the block diagram.

The code was written in C++ program and was burnt into the microcontroller.

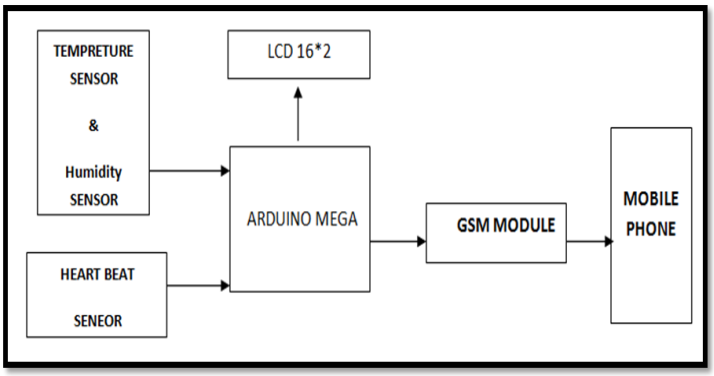

Figure 1. Patient Tracking Via GSM.

2.1. Hardware components:

1. Arduino Mega:

The Arduino Mega is a microcontroller board based on the ATmega1280. It has 54 digital input/output pins. 16 of which are analog inputs, 4 UARTs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. The Mega is compatible with most shields designed for the Arduino Duemilanove or Decimal.

The Arduino Mega can be powered by USB connection or with an external power supply. The power source is selected automatically.

Arduino Mega is shown below in figure 2.

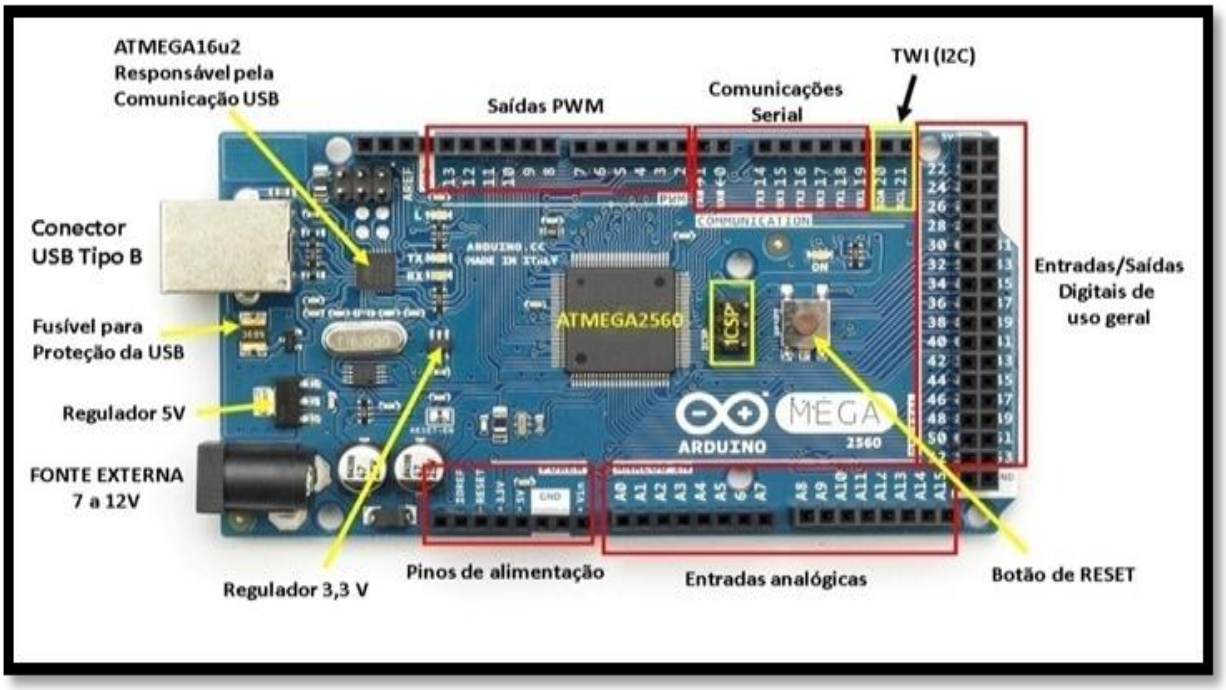

Figure 2: arduino mega

2. GSM MODULE – SIM900

This is a GSM/GPRS-compatible Quad-band cell phone, operates on frequencies: 850MHz, 900MHz, 1800MHz and 1900MHz. It can be used for oral communication and for SMSs. The processor is also in charge of a SIM card (3 or 1,8 V) which needs to be connected to the outer wall of the module.

In addition, the GSM900 device integrates an analog interface, an A/D converter, an RTC, an SPI bus, an I²C, and a PWM module. The radio section is GSM phase 2/2+ compatible and is either class 4 (2 W) at 850/ 900 MHz or class 1 (1 W) at 1800/1900MHz.

The TTL serial interface is in charge not only of communicating but also of receiving the circuit commands (in our case, coming from the PIC governing the remote control) that can be either AT standard or AT-enhanced SIMCom type. The module is supplied with continuous energy (between 3.4 and 4.5 V) and absorbs a maximum of 0.8 A during transmission [3].

Figure 3: GSM – SIM 900

3. Temperature sensor (lm35):

The LM35 series is precision integrated-circuit temperature sensor with an output voltage linearly-proportional to the Centigrade temperature. The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C to 150°C temperature range [4].

Temperature sensor is shown below in figure 4.

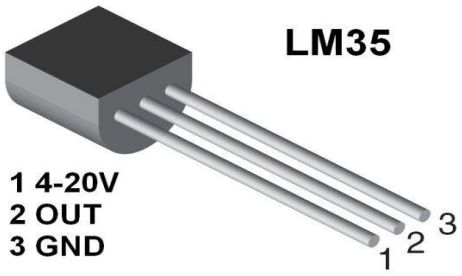

Figure 4**:** lm35

4. Heart beat (pulse sensor):

Heart rate data can be really useful whether you're designing an exercise routine, studying your activity or anxiety levels or just want your shirt to blink with your heart beat. The problem is that heart rate can be difficult to measure. Luckily, the Pulse Sensor Amped can solve that problem [5].

Pulse sensor is shown below in figure 5.

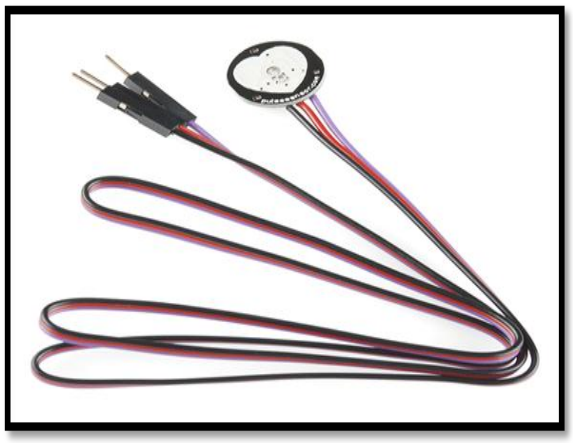

Figure 5: pulse sensor

5. LCD

LCD is Liquid Crystal Display screen. A 16x2 LCD display is basic module and commonly used in various devices and applications.

These modules are preferred, because they are economical, easily programmable, have no limitation of displaying special & even animations.

A **16x2 LCD** can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data [6].

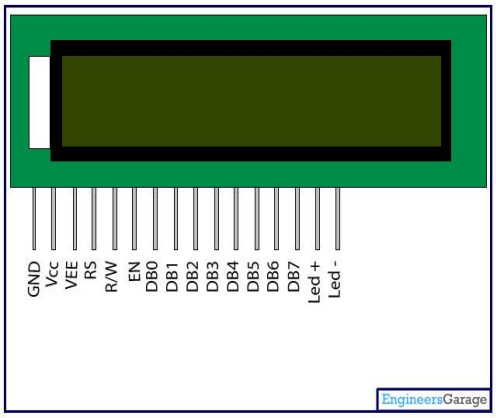

Figure 6: LCD 16*2

2.2. Software requirement:

1. ARDUINO IDE:

We can use any programming language for a compiler that produces binary machine code for the target processor. Atmel provides a development environment for their microcontrollers, AVR Studio and the newer Atmel Studio.

The Arduino provides the Arduino integrated development environment (IDE). It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board.

A program written with the IDE for Arduino is called a sketch. Sketches are saved on the development computer as text files with the file extension .ino. Arduino Software (IDE) pre-1.0 saved sketches with the extension.

The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures [7]. The Arduino ide is shown below in figure 7.

Figure 7: Arduino ide

3. SIMULATION AND RESULTS

GSM based Patient Health Monitoring system mainly works for allowing doctors or relatives of patient to check the status of patient health remotely. The system calculates the heartbeats and body temperature of patient and if it goes above certain limit then immediate informative alert message will be sent to the registered number. For this system we used AVR Family Microcontroller which is interfaced with LCD display, heartbeat sensor and temperature sensor. The GSM based Patient health monitoring system works with GSM modem to send the data remotely to the registered number, system powered by 12V transformer. The system also featured with manual health button using that the patient with some other issues will also able to contact with doctor so, the system is very helpful for saving life of patient. The system also introduced a function through which a doctor will able to check the status of patient after a certain interval of time by sending message.

The system efficiently updates doctor about health of patient as well as accurately calculates the health parameter of patient

As shown in the figure 8.

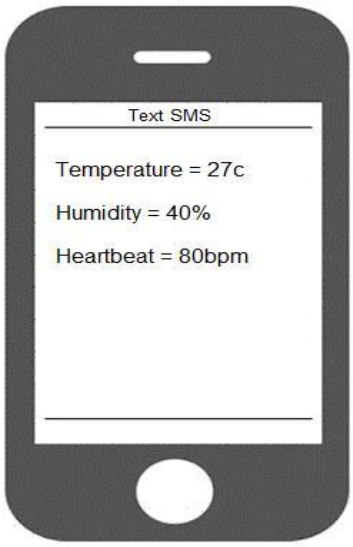

Figure 8: The form of the message to phone

2.3. Connections:

1-GSM with arduino:

1) GSM Module is powered using 12Volts DC adapter.
2) Arduino is powered using USB cable / Adapter.
3) rx pin of Arduino is connected to TX pin in GSM module.
4) tx Pin of Arduino is connected to RX pin of GSM Module.
5) Arduino GND is connected to GSM GND.

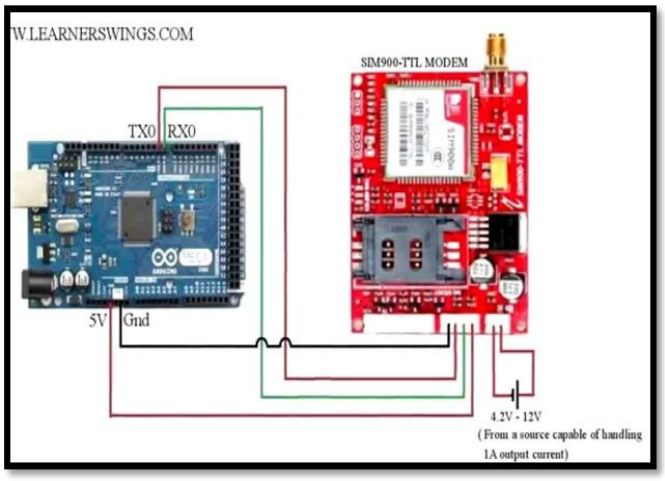

Figure 9: gsm with arduino[9]

2- Lm 35 with arduino:

Lm35 sensor has 3 pins:

1) VCC that should connect with 5 v of arduino
2) Vo that should connect to any analog pin of arduino
3) GROUND that connect to an arduino GND As shown in figure 10

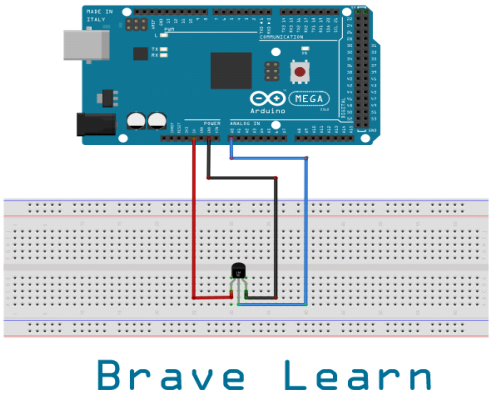

Figure 10: Temperature Sensor [8].

3- LCD Connection:

It has 16 pins and the first one from left to right is the Ground pin. The second pin is the VCC which we connect the 5 volts pin on the Arduino Board.

Next is the Vo pin on which we can attach a potentiometer for controlling the contrast of the display.

Next, The RS pin or register select pin is used for selecting whether we will send commands or data to the LCD. For example if the RS pin is set on low state or zero volts, then we are sending commands to the LCD like: set the cursor to a specific location, clear the display, turn off the display and so on. And when RS pin is set on High state or 5 volts we are sending data or characters to the LCD.

The lcd connections is seen below in figure 11:

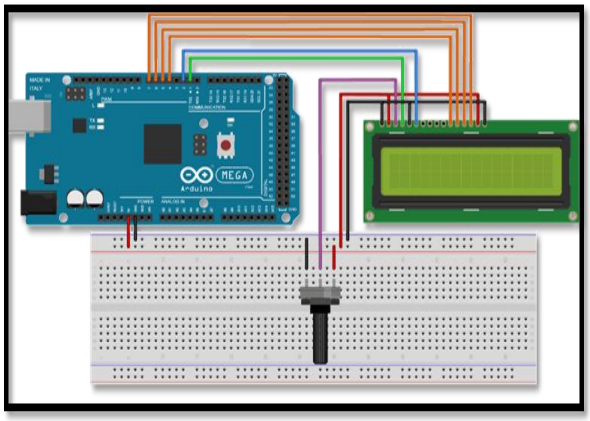

Figure 11: LCD with arduino[10]

3.1. Heart beat (pulse sensor):

The pulse sensor have the 3 pins:

- The first can be a negative pin connected to the Gnd of the Arduino.

- The second can be a positive pin connected to the 5V of the Arduino.
- The third can be a input pin connected to the Analog pin A0 of the Arduino.

As shown below in the figure 12:

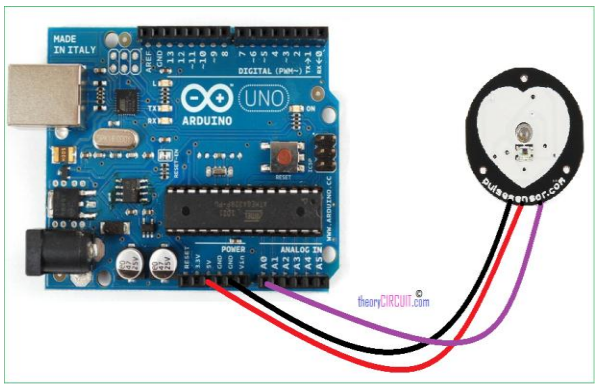

Figure 12: pulse sensor with arduino [11].

We have successfully designed and built a prototype system using a set electronic devices sensors and module.

An Arduino microcontroller is used to measure the pressure sensor outputs and transmit the information through a gsm transmitter. We have also built a display device that receives the wireless signal and displays the data pressure information on an lcd display. So the device send data sensor to mobile phone using a gsm and also show this data on lcd display

The results show that such a device can be built at a low cost and no time we have to enhance the accuracy of sensor or other element

Next figure 13 and 14 show our system output:

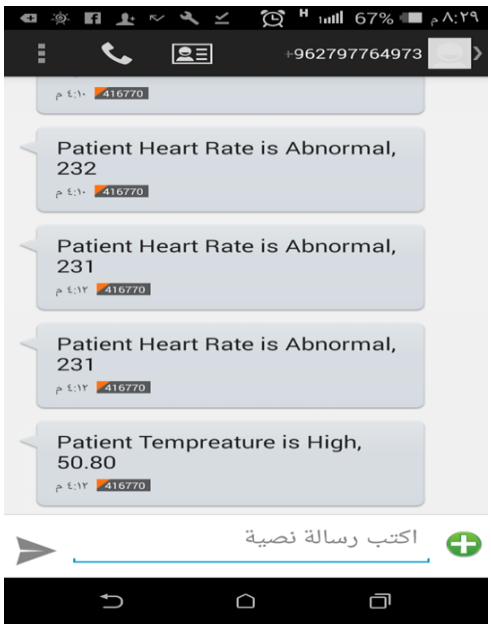

Figure 13: heart beat

Figure 13: SMS received and LCD output

4. CONCLUSION AND FUTURE WORK

As this system is based on different bio-sensors, microcontroller & GSM technology, it is used to transmit data wirelessly. It has a great application in the field of medicine to help Doctors to keep a keen eye on the patient's health. So the system is used to monitor the overall health of patient, which needs constant care. The data at receiver can be used to analyze the patients overall health condition.

As future development of this system, we can try the followings:

1. We can send this data to a remote internet
2. We can add the module of voice alarm system to indicate parameters crossing the threshold value.
3. Add more sensors

REFERENCES

[1] https://www.arduino.cc/en/Main/arduinoBoardMega

[2] http://www.imiktechnologies.in/index.php?id_product=7&controller=product

[3] https://www.open-electronics.org/gsm-remote-control-part-4-sim900/

[4] http://www.ti.com/lit/ds/symlink/lm35.pdf

[5] https://store.fut-electronics.com/products/heart-rate-pulse-sensor

[6] https://www.engineersgarage.com/electronic-components/16x2-lcd-module-datasheet

[7] https://www.arduino.cc/

[8] http://bravelearn.com/lm35-interfacing-with-arduino-mega-2560/

[8] http://www.learnerswings.com/2014/08/how-to-connect-sim900-ttl-gsmgprs-modem.html

[9] https://www.arduino.cc/en/Tutorial/HelloWorld

[10] http://www.theorycircuit.com/pulse-sensor-arduino/

[11] www.arduino.cc