



HOSPITAL PHYSIOLOGICAL MONITORING SYSTEM

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Abstract: While a large number of aged people are subject to heart disease, the need to a monitoring system that early detect the disease is increased. In this work physiological parameters, such as pulse rate, Temperature of human are measure through the proposed system. This system designed using Arduino, heart rate sensor, temperature sensor, and LCD.

Keywords: *Arduino, LCD, Temperature sensor, Heart rate sensor, C Language.*

نظام مراقبة الخصائص الحيوية في المستشفى

الخلاصة: بما ان اغلب كبار السن عرضة للاصابة بامراض القلب، فقد ازدادت الحاجة لنظام مراقبة يكشف عن المرض بشكل مبكر. في هذا البحث تم قياس العوامل الحيوية لجسم الانسان مثل عدد نبضات القلب ودرجة الحرارة باستعمال النظام المقترح. ان هذا النظام صمم باستعمال Microcontroller من نوع Arduino ، حساس لقياس نسبة نبضات القلب، حساس لقياس درجة الحرارة، وشاشة LCD.

1. Introduction

Health quality insurance is a problem all around the world. Large numbers of people aren't getting the standard care that they need. The scientific developments of the health equipment give us a different ways to solve this problem. Coronary sickness, as an example, heart assault, is that the main cause of death for people in varied nations. Frequently the heart problems hurt the aged people, who live in their own and no-one is willing to screen them for twenty-four hours daily [1].

Physiological parameters observance of the people is act as convert the unstable patient to stable state, blood pressure, blood sugar, temperature and heart rate are the most important parameters measured of a patient. Heart rate represents the number of heart beats during a minute, its normal average different by the age of the patient. For a people of 18 years old or more, the normal heart rate is about 72 beats in minute, in babies it may be about 120 beats while in a children reach about 90 beats[2].

Measurements of location and body temperature of the human can be good sources for monitoring [3]. When the human do its daily work, the heart beats will vary depending on the amount of effort done. By measuring the voltage produced by the

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heartbeat, its rate can be used for a health monitoring [4]. In this proposed system, the heart beat rates of patients and temperature are calculated or watch out by utilizing sensors as an easy methodology

2. Related Work

Many researchers work on patient monitoring systems such as: in [5] the researchers presented a system integrates web services with a wireless body area network to collect data remotely from the patients, the system collect Spo2 and heart rate data. Reference [6] presented a monitoring system using Bluetooth and wireless sensors, the collected data are blood pressure, temperature, and heart rate and this was done by using a bio sensors. In [7] the proposed system measures the heart rate and temperature using wireless sensor with a web based service, the system use a data base for any possible problems. Reference [8] Proposed a system with artificial neural fuzzy that work as a smart monitoring system, the system measure three factors for the patient which are: temperature, heart rate, and the position of the patients to detect if he was walking, sitting, sleeping and so on. Paper [9] Proposed a system uses sensors integrated with LabVIEW and Arduino to collect patient parameters, such as temperature, heart rate, GSR, and ECG.

3. Implementation of Patient Monitoring System

In This section the hardware components, such as Arduino and sensors will be explained, in addition the software requirements will discussed also.

3.1. Hardware requirements

- **The Arduino Uno**

Arduino is a simple microcontroller used in research and education all over the world. Its simplicity is from that the user not needs any knowledge about its internal or technical consideration. The Arduino can contact with the external world through many input and output equipment such as sensors, LED, LCD, switch and others. Many types of sensors are available include temperature sensor, switches, ultrasound sensor, and accelerometers. Arduino is simple in connecting the devices and external components connected to it [10].

Arduino Uno is an 8 bit microcontroller based on the ATmega328 chip. It contains 6 analogue in pins (pins 0–5), 14 Digital I/O pins (pins 0–13), and 6 Analogue Out pins (pins 3, 5, 6, 9, 10, and 11) these are subset from the digital pins that can be reprogrammed to work as analogue output using the IDE [11].

It also contains power pins such as, VCC, GND, power jack, a 16 MHz ceramic resonator, reset button, and a USB connection. It has 2kb memory of type SRAM and a flash memory of 32kb [12]. As shown in Fig. 1, [13].

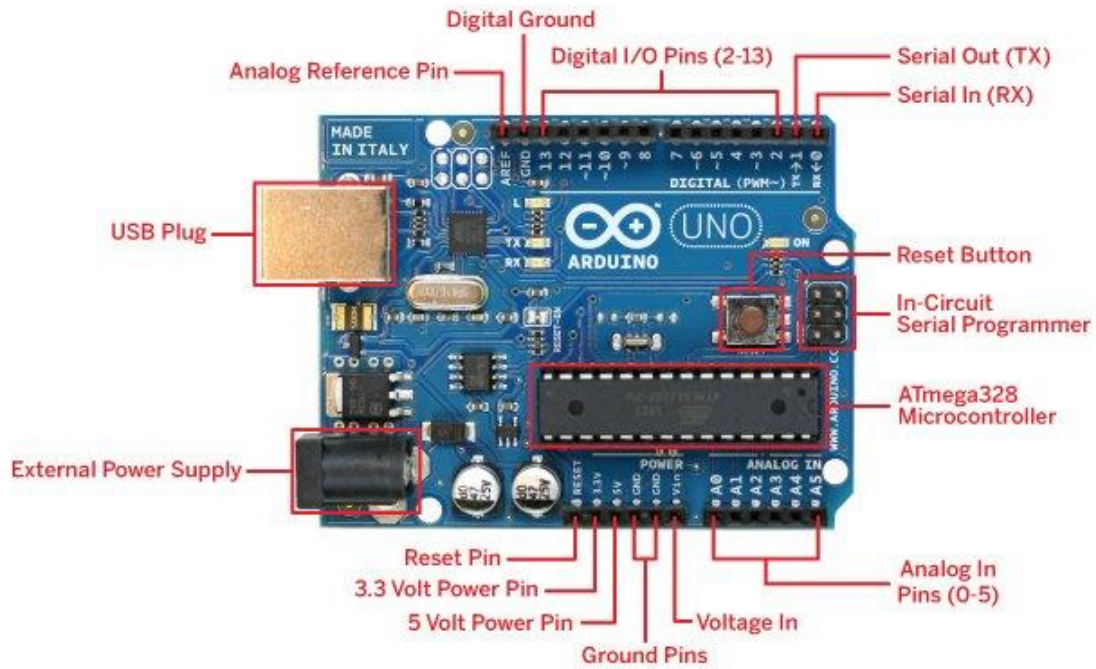


Figure 1. Uno Board [13]

- **Heart rate Sensor**

The heart rate sensor is work when the user put its finger on it. It gives an output as pulse with each heartbeat. The sensor calculates the number of beats per minutes when it is connected to Arduino. It can sense the change of light by blood course of the finger with each pulse. As shown in Fig. 2 [1].

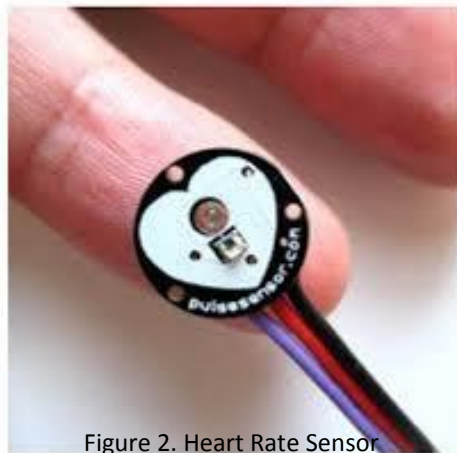


Figure 2. Heart Rate Sensor

- **Temperature Sensor**

Many different types of temperature sensors are available; one of them is DHT11 temperature and humidity sensor.

The DHT11 sensor has three pins and some has four. One of the parameter that the sensor calculated is the heat index, which represents the heat felt by the skin from the environment. The sensor is shown in Fig. 3 [14].

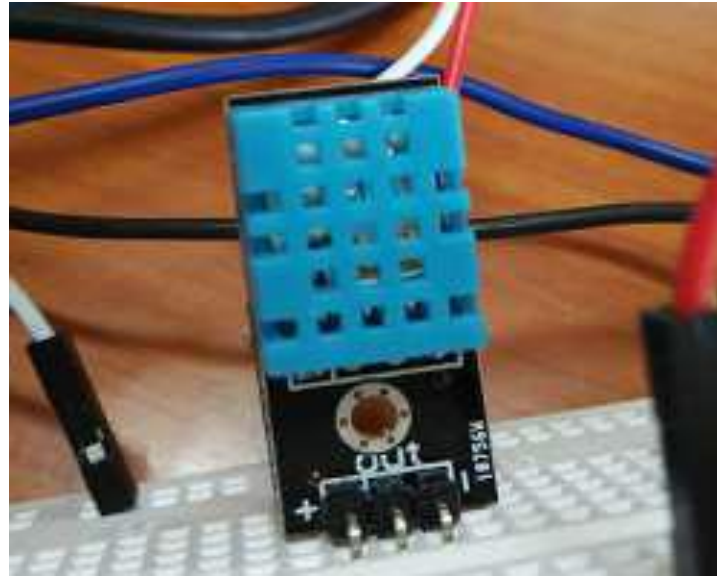


Figure 3. Temperature Sensor

- LCD

LCD's used with Arduino are simple and inexpensive devices used to display the text and numbers and characters. LCD can vary in price and size, it measure by the number of row and columns of digits that can be displayed on it. As shown in Fig. 4 [15].

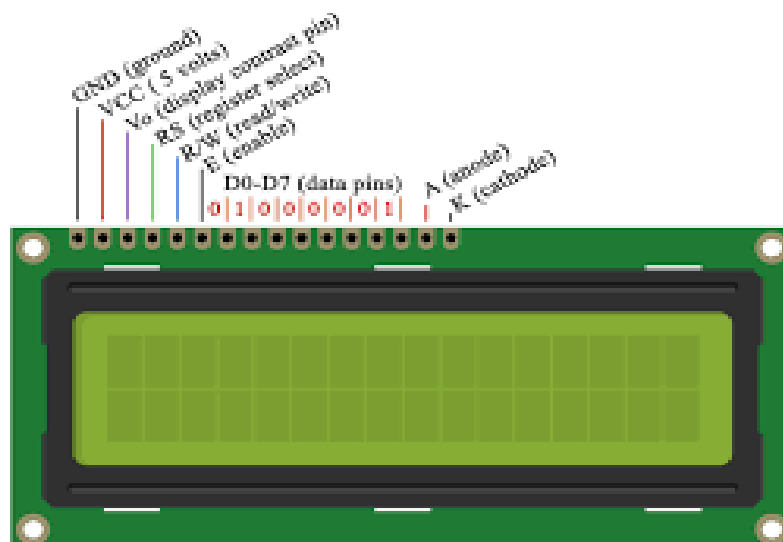


Figure 4. 16x2 LCD

3.2. Software Requirement

The software code for any Arduino project is written in C or C++ language, and called sketch. This sketch can be easily written by a certain program called Arduino IDE. The IDE help the user to write and edit the code, convert it to machine language of the Arduino, then upload to Arduino board [10].

As shown in Fig. 5, the Arduino IDE program likes a simple word process program. The IDE is divided into number of main areas contain: title bar, menu bar, icons, command area, message window area, and text area, [15].

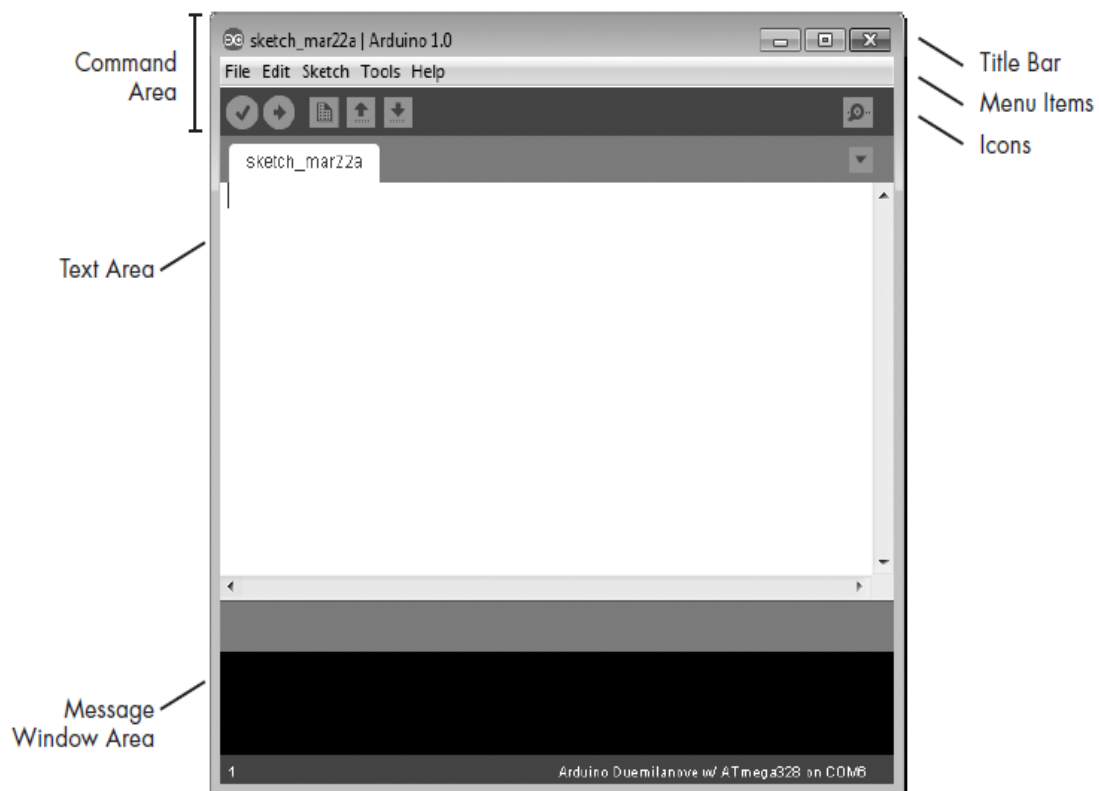


Figure 5. The Arduino IDE

The Arduino microcontroller can be programmed simply using Arduino IDE, just select the board type, which is Arduino Uno, write the program in C or C++ language, and select upload. Arduino can compile and upload the sketch to execute it [12].

3.3. Circuit Design

The circuit design of the proposed system is consist of Arduino, sensors, and LCD is shown in Fig. 6, while the hardware implementation of this circuit is shown in Fig. 7.

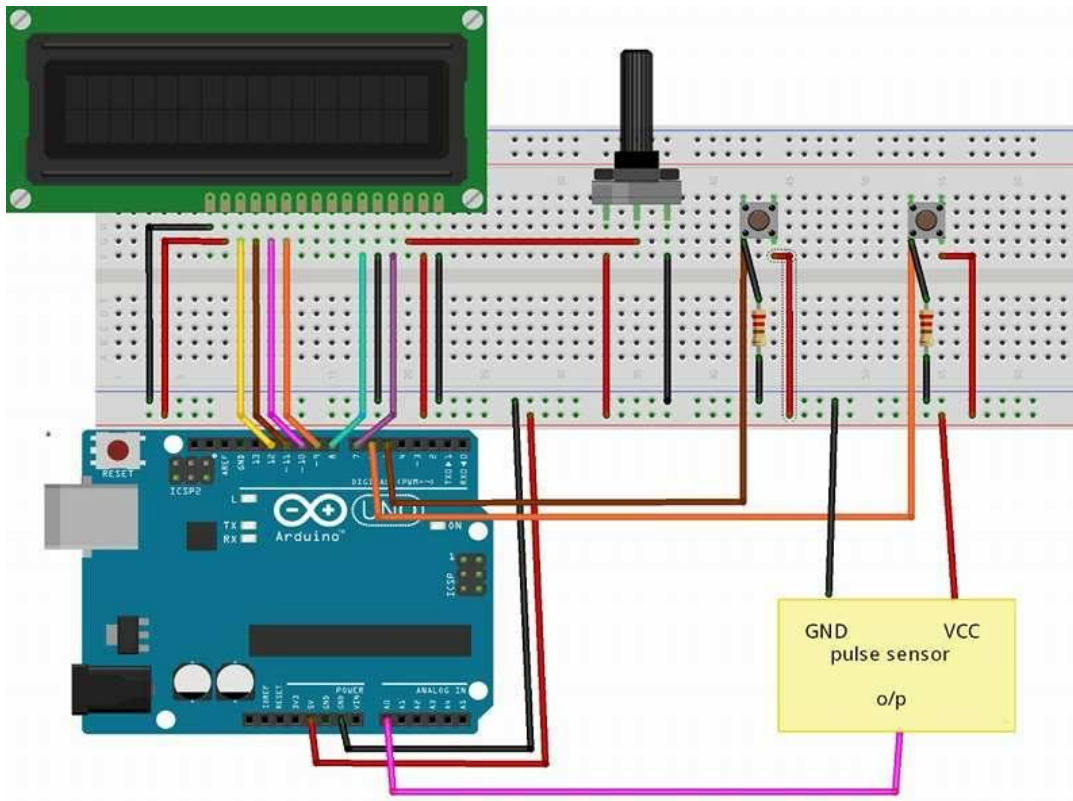


Figure 6. Circuit design

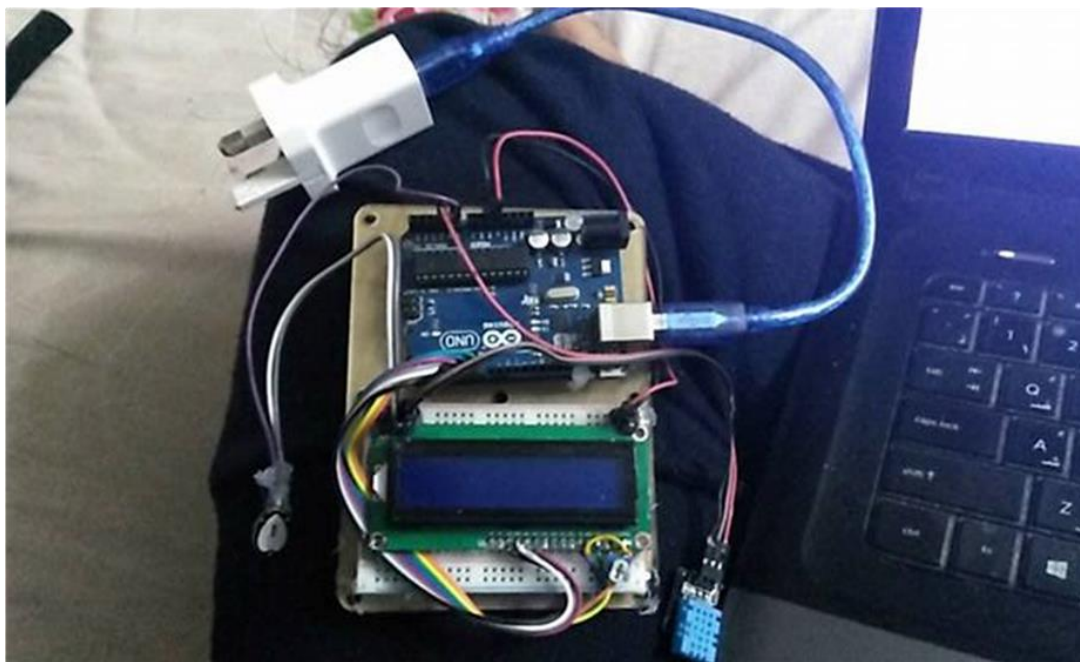


Figure 7. Hardware Implementation

When the patient touches the sensors, and waits for a several seconds the Arduino reads the data from human body and display the heart rate and temperature to the user in the LCD. As shown in Fig. 8.

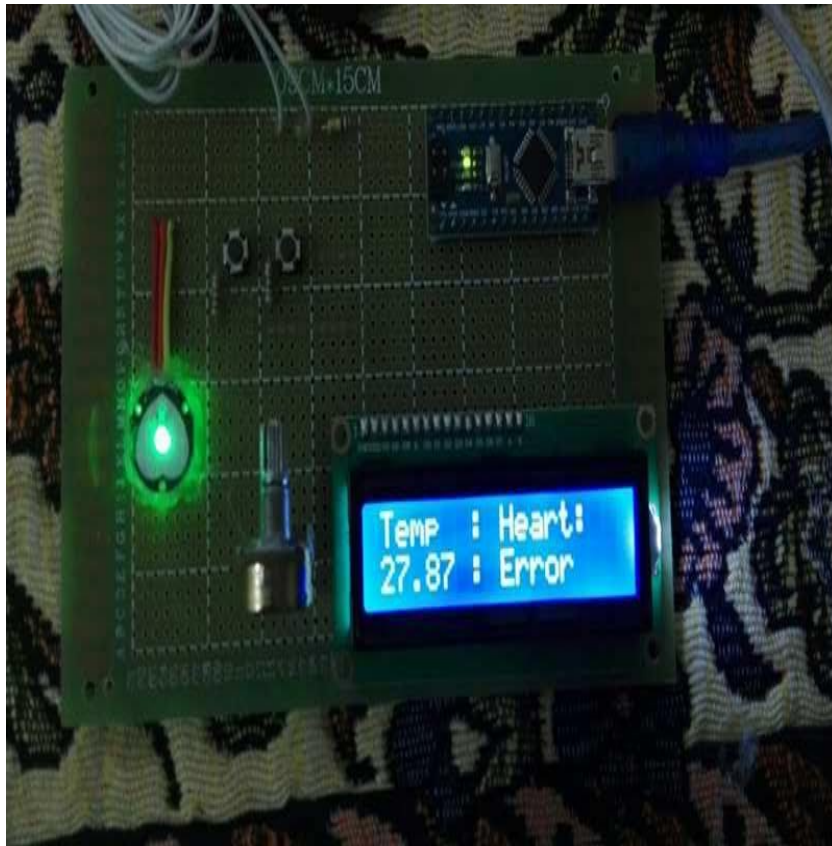


Figure 8. Temperature Reading

In Fig. 9, when the patient put his thumb on the heart rate sensor, the LCD will display the heart beat rate.



Figure 9. Heart Rate Reading

4. Tests Results

In this section, simple tests were applied to a number of persons, and the results were recorded as in table1.

No.	name	age	temperature	Heart rate	Date and time of test
1	Ahmed	10	37	76	24 Nov 11 AM
2	Ali	35	37.1	72	25 Nov 9 AM
3	Mohammed	57	37.3	64	26 Nov 8 AM

5. Conclusions

Many important aspects have been developed through the implementation of the project such as how to implement a monitoring system using Arduino and program it using C language, how to connect the sensors and use it with Arduino, and how to use the LCD. The proposed system shows that the process of reading the heart rate and temperature is very simple and the data is easily displayed on the LCD.

The cost of the proposed system at overall is inexpensive. In the local market in Iraq the cost may not exceed 50\$ only, so that this proposed system simply can be used at home. Simple modification in the design may be required to convert it to a portable device with a battery for general use.

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