

DESIGN AND IMPLEMENTATION OF HEARTBEAT MONITORING SYSTEM USING PULSE SENSOR

**A Project submitted in partial fulfillment of the requirements for the
Award of Degree of
Bachelor of Science in Electrical and Electronic Engineering**

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December 2018

CERTIFICATION

This is to certify that this project entitled “**DESIGN AND IMPLEMENTATION OF HEARTBEAT MONITORING SYSTEM USING PULSE SENSOR**” is done by the following students under my direct supervision and this work has been carried out by them in the laboratories of the Department of Electrical and Electronic Engineering under the Faculty of Engineering of Daffodil International University in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering. The presentation of the work was held on December 2018.

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DECLARATION

The project and thesis entitled “**Heartbeat Monitoring**” submitted by Name: **Atiqul Islam**, ID: **151-33-2311**, Name: **Abu Hanif**, ID: **151-33-2368** Session: spring 2015 has been accepted as satisfactory in partial fulfillment of the requirements for the degree of **Bachelor of Science in Electrical and Electronic Engineering** on December 2018.

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CONTENTS

List of Figures	VI
List of Tables	VII
List of Abbreviations	VIII
Acknowledgment	IX
Abstract	X
Chapter 1: INTRODUCTION	1-2
1.1 Introduction	1
1.2 Project Objectives	1
1.3 Scope of Project	1
1.4 Report Outline	2
Chapter 2: COMPONENTS	3-9
2.1 Introduction	3
2.2 Component List	3
2.2.1 Arduino Pro Mini	3
2.2.2 LCD Display	4
2.2.3 Variable Resistor	5
2.2.4 DC Connector	6
2.2.5 Connector	7
2.2.6 Vero board	8
2.2.7 Soldering Wires	8
2.3 Summary	9
Chapter 3: THEORETICAL MODEL	10-12
3.1 Basic Block Diagram	10
3.2 Circuit Diagram and Explanation	11
3.3 Arduino Circuit	11
3.4 Summary	12

LIST OF FIGURES

Figure #	Figure Caption	Page #
2.1	ArduinoPro mini	4
2.2	LCD Display	5
2.3	Variable Resistor	6
2.4	DC Connector	7
2.5	Connector	7
2.6	Vero Board	8
2.7	Soldering Wires	9
3.1	Basic Block Diagram	10
3.2	Arduino Circuit Unit.	11
3.3	Arduino Pro mini Circuit Atmega328	12
4.1	Mikro C software	13
4.2	Burning Boot Loader Process	14
4.3	Power Supply	15
4.4	System of the Flow chart	16
5.1	Our Project Picture	17
5.2	Output displaying Heartbeat on the LCD screen	18

LIST OF TABLES

Table #	Table Caption	Page #
5.1	Cost Analysis	19

LIST OF ABBREVIATIONS

CD	Chromatic Dispersion
EMI	Immune to Electromagnetic Interference
FBG	Fiber Bragg Gratings
FWHM	Full Width at Half Maximum
GVD	Group Velocity Dispersion
LED	Light Emitting Diodes
MD	Material Dispersion
NLSE	Nonlinear Schrödinger Equation
PMD	Polarization Mode Dispersion
PUA	Piecewise Uniform Approach
RMS	Root Mean Square
SSMF	Standard Single Mode Fiber
TFBG	Tilted Fiber Bragg Gratings
UV	Ultraviolet
WD	Wave-guide Dispersion
WDM	Wavelength Division Multiplexed

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ABSTRACT

This paper depicts the working of a Heartbeat checking framework dependent on a microcontroller ATmega328 (Arduino Uno). Most observing frameworks that are being used in this day and age works in disconnected mode yet our framework is planned with the end goal that a patient can be checked remotely continuously. The proposed methodology comprises of sensors which estimates heartbeat of a patient which is controlled by the microcontroller. Readings are shown in LCD screen. The heartbeat sensor checks the heartbeat for explicit interim of time and gauges Beats every Minute while the information are sent to the microcontroller. At last, the information are shown at the less than desirable end. This framework could be made accessible at a sensible expense with incredible impact.

CHAPTER 1

INTRODUCTION

1.1 Introduction

This section gives the short depiction about the requirement for Heartbeat observing its significance. This part additionally gives the short depiction about the extent of the task and plan approach. Persistent Monitoring System is where a specialist can constantly screen more than one patient at any given moment in a remote place.

1.2 Project Objectives

Some serious sicknesses and scatters e.g. heart disappointment needs close and ceaseless observing method after finding, so as to avoid mortality or further harm as optional to the referenced maladies or disarranges. Checking these kinds of patients, normally, happen at doctor's facilities or medicinal services focuses. Heart arrhythmias for example, much of the time, require consistent long haul observing. In any case, the patients are frequently too soon discharged, inferable from need of clinic bed for another patient on the holding up rundown, who should be hospitalized quickly.

1.3 Scope of Project

Long sitting tight time for hospitalization or wandering patient checking/treatment, are other understood issues for both the human services organizations and the patients. This task gives human services specialists to boost the quality and broadness of social insurance benefits by controlling expenses. As the populace increments and interest for administrations expands, the capacity to keep up the quality and accessibility of consideration, while successfully overseeing money related and HR, is accomplished by this undertaking. The utilization of present-day correspondence

innovation in this setting is the sole conclusive factor that makes such correspondence framework effective

1.4 Report Outline

- **Introduction:** Introduction, Project Objectives, Scope of Project
- **Equipment:** Introduction, Component List (Arduino Pro Mini, LCD Display, Variable Resistor, DC Connector, Connector, Vero board, Soldering Wires), Summary
- **Theoretical Model:** Basic Block Diagram, Circuit Diagram and Explanation, Arduino Circuit, Summary.
- **Hardware Development:** Writing Programming, Burning the Program, Power Supply, System of the Flowchart, Summary
- **Result and Dictations:** Introduction, Our Project, Result, Cost Analysis, Discussion, Summary
- **Conclusion and Recommendations:** Conclusion, Advantages, Future Scope

CHAPTER 2

COMPONENTS

2.1 Introduction

To complete this project, many types of research and analyze the digital railway crossing system and their theories had been done. Several of sources were being the reference for this research such as texts book, journals and internet source. From the past research, many methods were achieved to solve the problem of this project and related to the theory.

2.2 Component List

- Arduino pro mini
- LCD Display
- Variable Resistor
- DC Connector
- Connector
- Vero board
- Soldering Wires

2.2.1 Arduino Pro Mini

In this undertaking, we have utilized a microcontroller to control entire the procedure of a framework that is Arduino por smaller than normal board. As a matter of fact, Arduino is anything but a unimportant controller as it has a working framework or boot-loader which keeps running on. [1]



Figure 2.1 Arduino pro mini

2.2.2 LCD Display

16×2 LCD is named so on the grounds that; it has 16 Columns and 2 Rows. There is a great deal of mixes accessible like, 8×1, 8×2, 10×2, 16×1, and so on. Be that as it may, the most utilized one is the 16*2 LCD; thus we are utilizing it here.

All the previously mentioned LCD show will have 16 Pins and the programming approach is additionally the equivalent and consequently the decision is left to you. The following are the Pinout and Pin Description of 16x2 LCD [12]

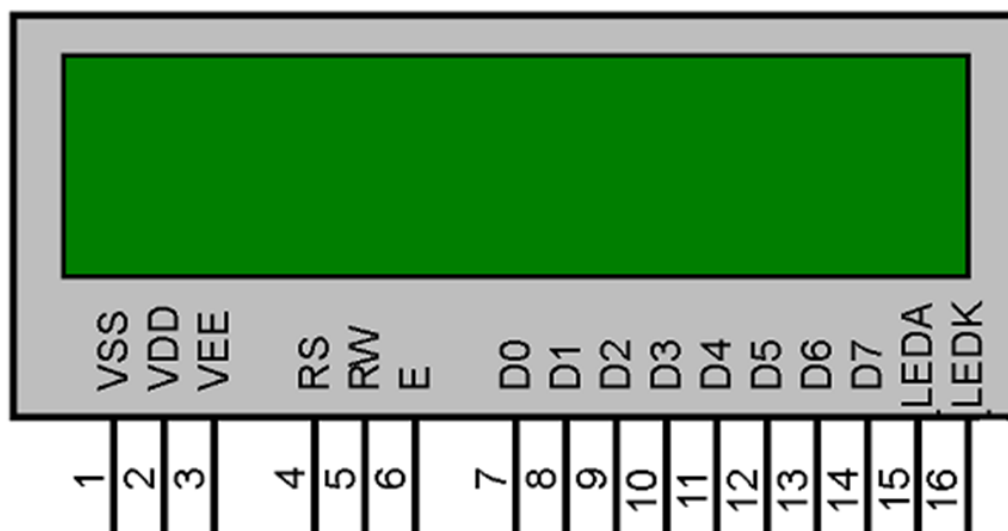


Figure: 2.2 LCD Display.

2.2.3 Variable Resistor

A resistor limits flow stream in an electrical circuit without turning the flow off. A variable resistor permits more command over the current stream by changing the measure of opposition. At the point when obstruction increments in a variable resistor, the measure of current that is permitted to stream in a circuit diminishes. Two essential segments make up factor resistors. The resistive material is the primary segment and is known as the component. The second segment, called the wiper or brush, is utilized to set the obstruction and is regularly controlled with a handle or sliding switch.



Figure: 2.3 Variable Resistor

2.2.4 DC Connector

A DC connector (or DC plug, for one regular kind of connector) is an electrical connector for providing direct flow (DC) control. Contrasted with local AC control attachments and attachments, DC connectors have a lot increasingly standard sorts that are not exchangeable. The measurements and course of action of DC connectors

can be avoided coincidental interconnection of contradictory sources and loads. Types change from little coaxial connectors used to control compact electronic gadgets from AC connectors, to connectors utilized for car embellishments and for battery packs in versatile gear.

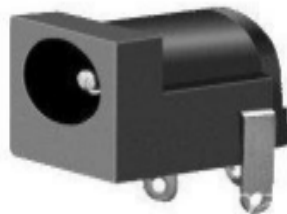


Figure: 2.4 DC Connector

2.2.5 Connector

A connector is an electro-mechanical gadget for joining electrical circuits as an interface utilizing a mechanical gathering. Connectors comprise of fittings (male-finished) and jacks (female-finished). The association might be transitory, with respect to convenient gear, require a device for a get together and expulsion, or fill in as a perpetual electrical joint between two wires or gadgets. A connector can be utilized to adequately unite different connectors.

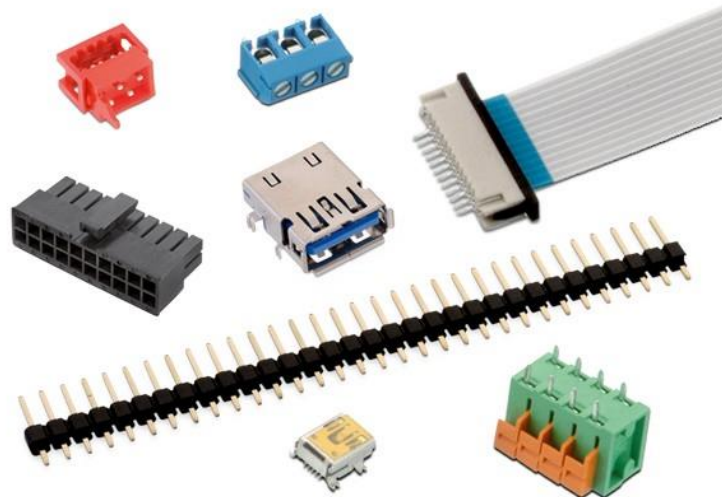


Fig: 2.5 Connector

2.2.6 Vero board

Vero board is a brand of stripboard, a pre-formed circuit board material of copper strips on an ensuring board. Which is the customary name for an extensively used kind of equipment prototyping board depicted by a 0.1-inch ordinary system of holes, with wide parallel strips in copper cladding running one way the separation across more than one side of the board? It is conventionally also known by the name of the main thing Vero board, which is a trademark, of British association Vero Technologies Ltd and Canadian association Pixel Print Ltd. In using the board, breaks are made in the tracks, generally around holes, to confine the strips into various electrical centers. With a thought, it is possible to break between holes to mull over portions that have two stick pushes only a solitary position isolated, for instance, twin segment headers for IDCs. .

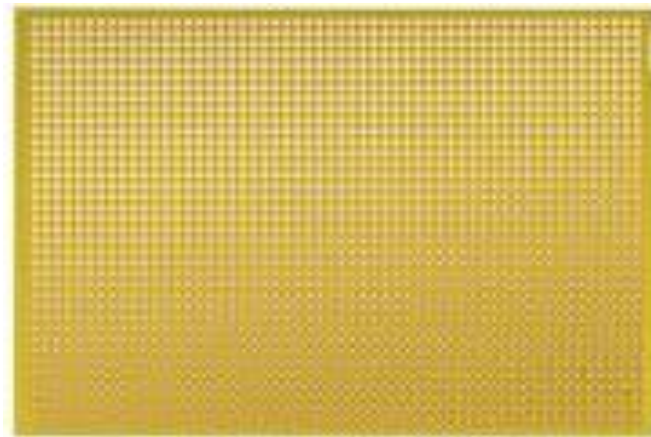


Figure: 2.6 Vero Board

2.4.7 Soldering Wires

Weld is on a very basic level a metal wire with a "low" softening point, where low for our inspirations suggests low enough to be broken up with a coupling iron. For contraptions, it is usually a mix of tin and lead. Exactly when the attaching wire cooled an electrical affiliation will lead. This is getting a not too bad mechanical relationship between the wires. The filaments of each wire should be turned together, continue progressively like a single component. The underlying advance is to set up the wires by then tinning the wears, by join the wires and weld unite together.



Figure: 2.7 Soldering Wires

2.3 Summary

The chapter describes some important equipment that related to the project. Describes of all equipment like Arduino, Microcontroller (Atmega328), Heartbeat Sensor, LCD, Connector, Vero board, that works properly use for show data read related this project.

CHAPTER 3

THEORETICAL MODEL

3.1 Basic Block Diagram

In this Arduino, Heartbeat sensor and LCD interfacing, Arduino Pro Mini is used to

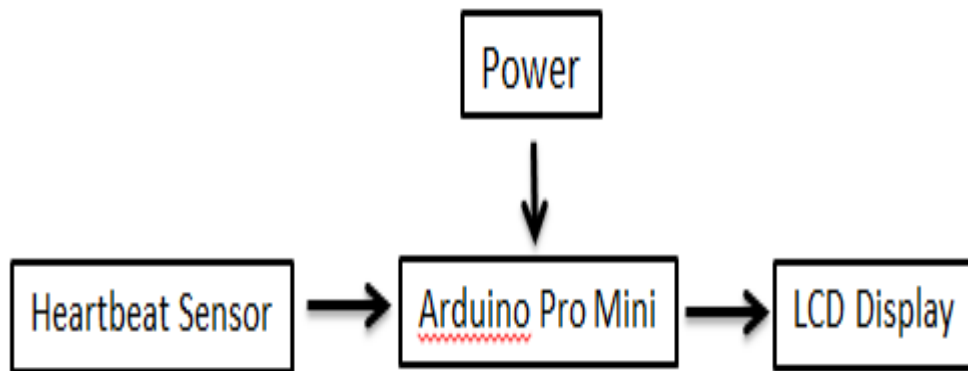
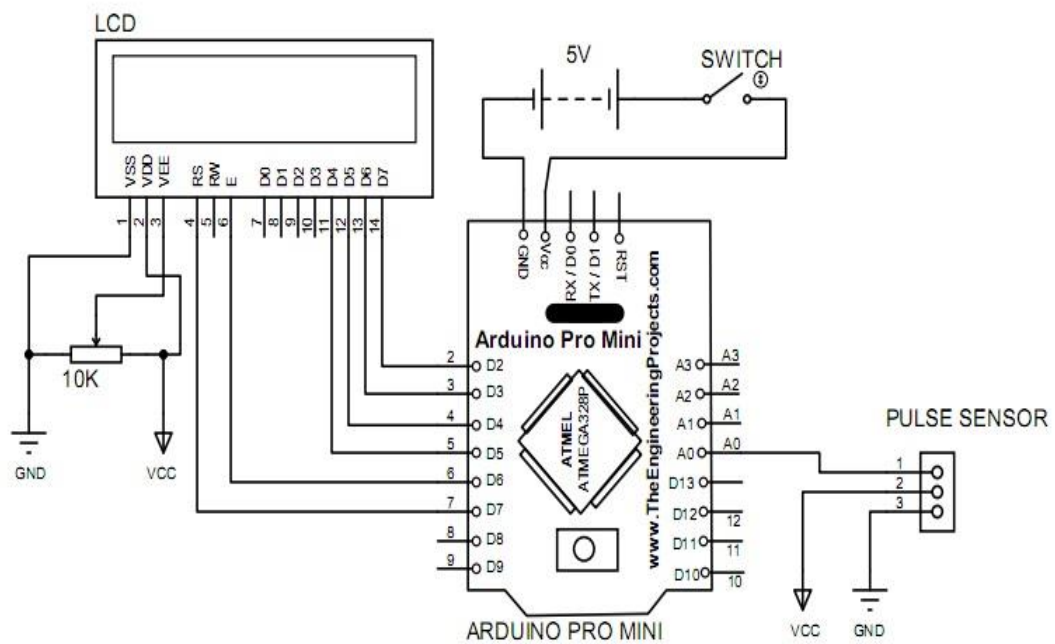


Figure: 3.1 Basic Block Diagram

Control the entire procedure. A Heartbeat sensor is utilized for detecting condition which gives a flag on each 10mV change at its yield stick. You can without much of a stretch check it with a voltmeter by interfacing Vcc at stick 1 and Ground at stick 3 and yield voltage at stick 2 of the Heartbeat sensor. For a precedent, if the yield voltage of the heartbeat sensor is 250m volt that implies the Heartbeat sensor is run a LCD value showing .

Arduino peruses yield voltage of heartbeat sensor by utilizing. After Arduino sends these flag to the LCD display.

3.2 Circuit Diagram and Explanation



Heartbeat Monitoring

Figure: 3.2 Arduino Circuit Unit.

Circuit diagram for Heartbeat monitoring using Arduino, heartbeat sensor, is shown in the above figure. Make the connections carefully as shown in the schematic. Data pins of LCD are connected to Arduino digital pin number 2, 3, 4, 5, 6, 7. An Heartbeat sensor is also connected to Digital Pin A0 of Arduino.

3.3 Arduino Circuit

Arduino Pro Mini circuit was build and the main components for the main circuit for this Arduino are required in order to operate the Arduino Pro mini. In this circuit, the Arduino is connected to the Heartbeat sensor, LCD and power supply for a wake up the Arduino.

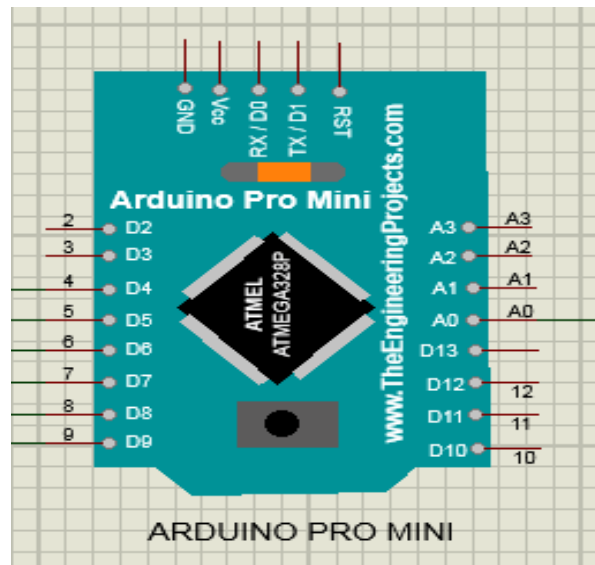


Figure 3.3 Arduino Pro mini Circuit Atmega328

3.4 Summary

In this chapter has discussed block diagram, circuit diagram, Advantage and Disadvantage of this project. It has also explained the operating system of the project.

CHAPTER 4

4.1.1 Writing Programming

There are several C compilers on the market for the Atmega328 microcontroller. These compilers have many similar features and they can all be used to develop C based high-level programs for Atmega328 microcontroller some of the C compilers used most often in commercial, industrial and educational.

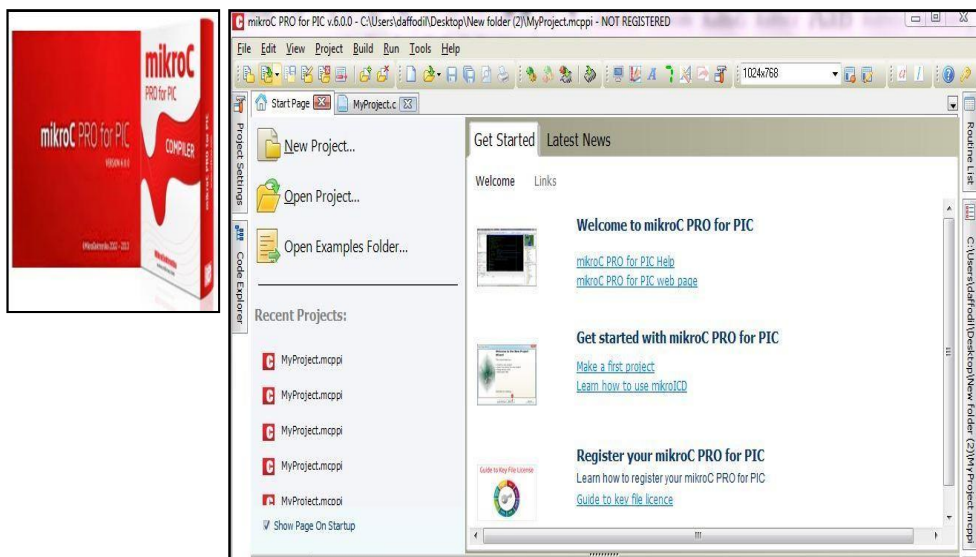


Figure 4.1: Mikro C software

Atmega328 microcontroller applications are – Mikro C, CCS, and Atmega328. This project is used by mikro C. The popular and powerful mikro C is easy to learn and comes with the high resources. Mikro C is a built-in simulator and an in-circuit debugger. The program is compiled by a compiler Mikro C. After the conversion process, a hexadecimal code is generated. The mikro C for writing programming shown in figure 4.1

4.1.2 Burning the Program

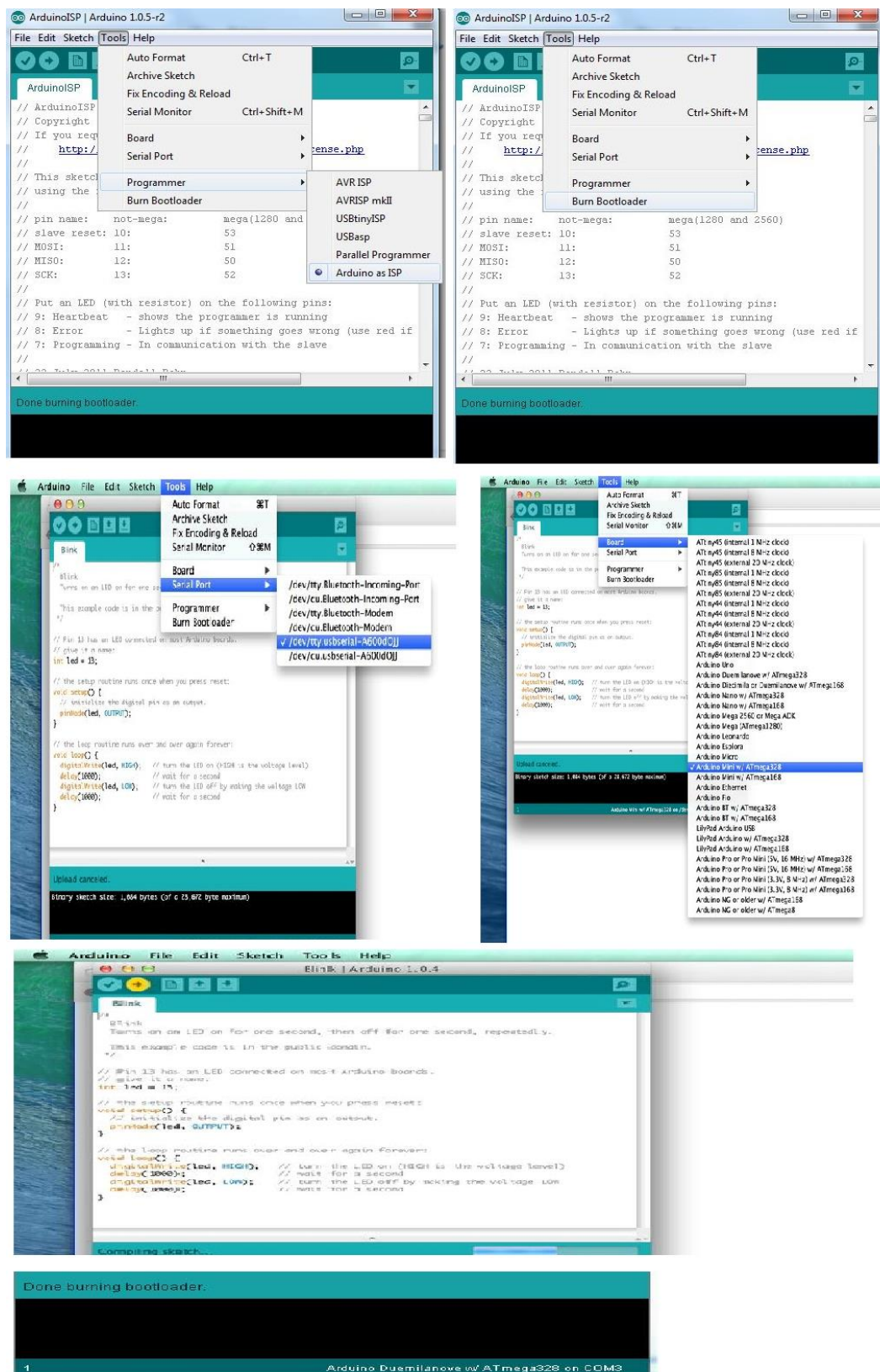


Figure 4.2: Burning Boot Loader Process

Connect the all circuit connection now open the Arduino software and select Tools->Board ->Arduinio Pro or Pro Mini (5V, 16MHZ) / ATmega328. If we select the Arduino pro we can see the selected board in the bottom of the software as shown in the above image.

And open the coding we want to program and click the upload button. Now we can see that program uploading into pro mini. We can see the Tx and Rx Led in Arduino Uno board blinking while program uploading. After uploading of the code. Now remove all connection and give power supply to the pro mini. Our code works perfectly on Arduino mini.

4.2 Power Supply

A battery holder is at least one compartments or chambers for holding a battery. For dry cells, the holder should likewise reach the battery terminals. For wet cells, links are regularly associated with the battery terminals, as is found in vehicles or crisis lighting hardware.



Figure: 4.3: Power Supply

A battery holder is either a plastic case with the state of the lodging shaped as a compartment or, or a different plastic holder that is mounted with screws, eyelets, stick, twofold sided tape, or different means. Battery holders may have a cover to hold and secure the batteries. Curled spring wire or level tabs that press against the battery terminals are the two most normal techniques for making the electrical association

inside a holder. Outside associations on battery holders are generally made by contacts with pins, surface mount feet, bread boards, or wire leads. [7]

4.3 System of the Flowchart

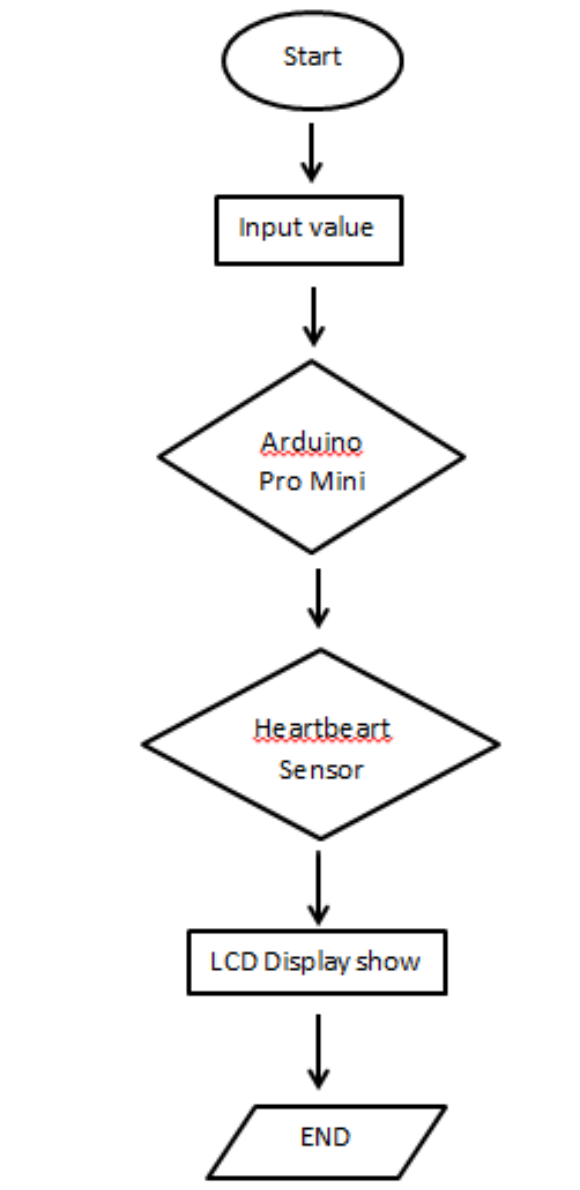


Figure: 4.4 System of the Flowchart

4.5 Summary

In this chapter has discussed Writing and burning program. Also discussed power supply and Flowchart system It has also explained about these topics of the project.

CHAPTER 5

RESULTS AND DISCUSSIONS

5.1 Introduction

This chapter will present all the results and calculations and relevant discussions.

5.2 Our Project

After connecting all equipment according to the circuit we had created the body structure following to the other experimental example from the internet. After preparing the body structure and connection of the circuit we prepared a logic program with the help of C++ program by Arduino. Our project picture is given below:

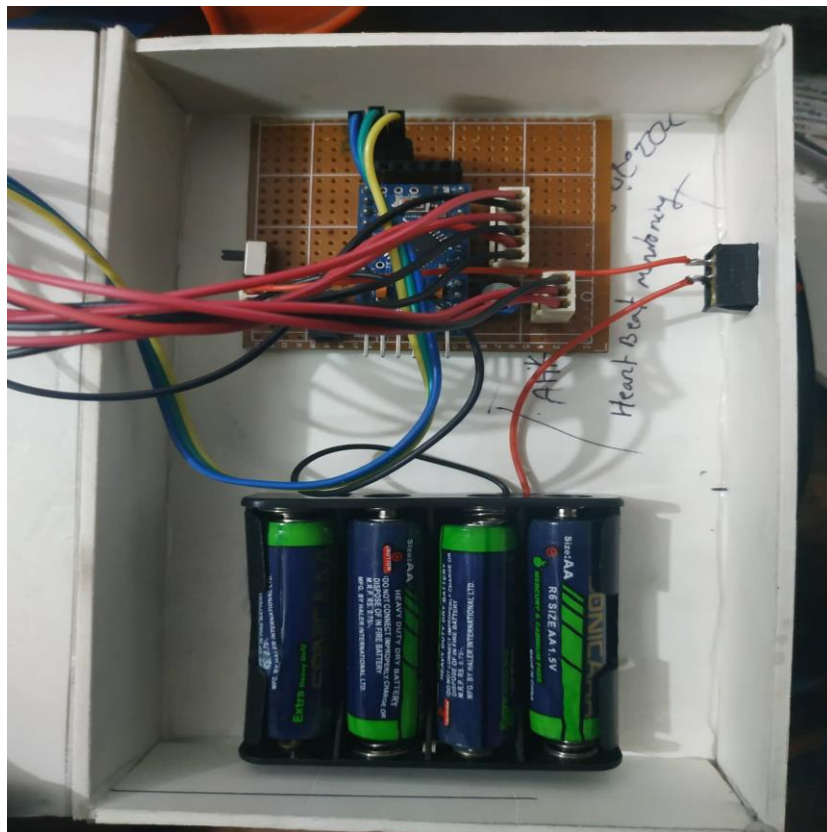


Fig. 5.1 Our Project Picture

After complete the program, we uploaded the program to the Microcontroller. Then we interface the software and hardware part. After completing the entire program and body with the interface we had tried to experiment it is it work or not. We saw that our project working perfectly. [10]

5.3 Result

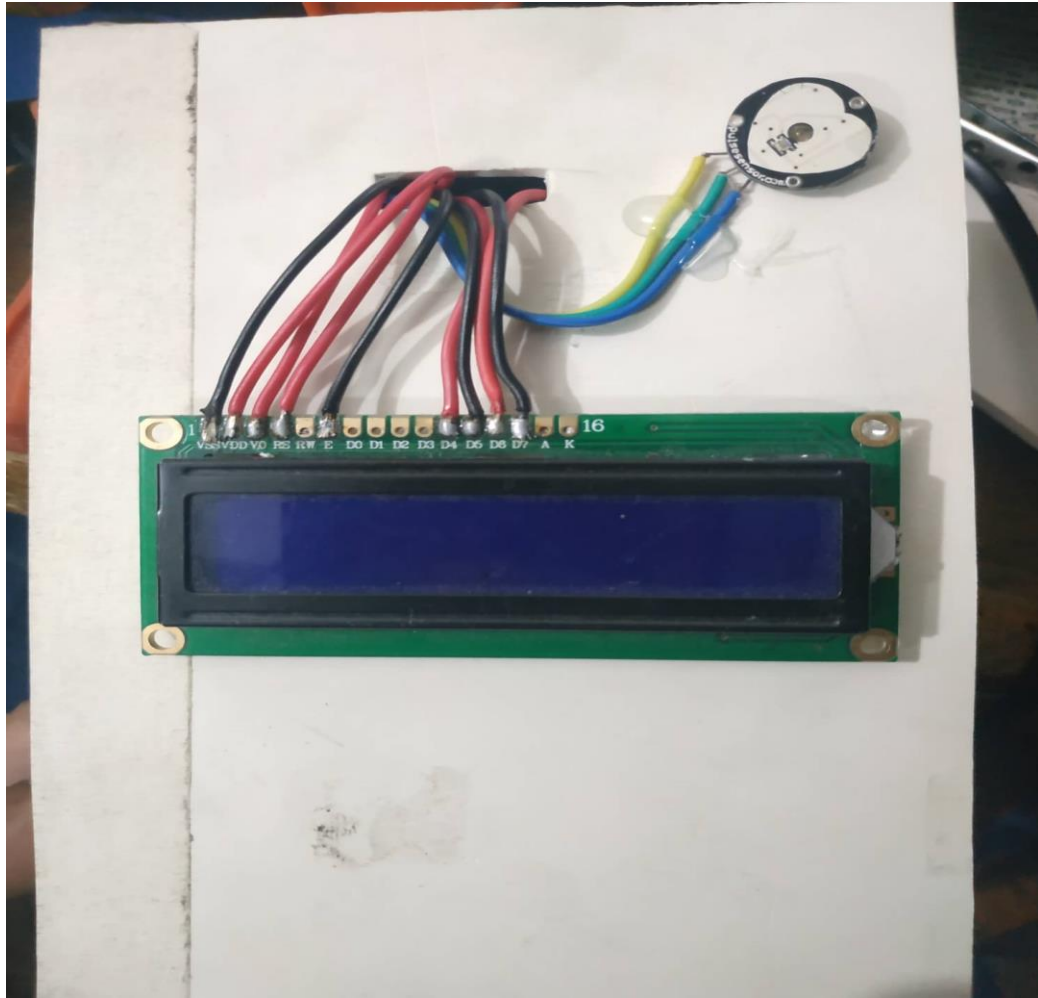


Figure: output displaying Heartbeat on the LCD screen.

This project name Heartbeat Monitoring using Arduino mini, Heartbeat Sensor, and LCD. The project measured heartbeat and give the output displaying the value on the LCD screen.

5.5 Cost Analysis

Table 5.1: Cost Analysis

Serial	Components	Price in (BDT)
01	Arduino Pro Mini	350/-
02	Heartbeat sensor	800/-
03	Connecting wire	100/-
04	Power supply	150/-
05	Vero board	50/-
06	Wire connector	100/-
07	LCD	400/-
08	Battery box	120/-
09	White Wood Board	250/-
10	Glue Gun Stick	50/-
11	Reel Connector	50/-
12	Charging Port	30/-
13	Others	300/-
Total Cost		2750/-

5.5 Discussion

Above is the quite simple schematic. The LCD panel's Enable and Register Select is connected to the Control Port. The Control Port is an open collector / open drain output., there is a few which don't. the circuit is more portable for a wider range of computers, some of which may have no internal pull up resistors. We can use a bench power supply set to 5v or use anon board +5 regulators. Remember a few de-coupling capacitors, especially if we have trouble with the circuit working properly

5.6 Summary

In this chapter has discussed the result and discussion. With our project, we became successful to demonstrate with regarding the objectives of the project. At last, completing this chapter the project is ready to use.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

Biomedical designing (BME) is the utilization of building standards and procedures to the medicinal field. It joins the structure and critical thinking abilities of building with medicinal and organic sciences to enhance patient's social insurance and the personal satisfaction of people. A restorative gadget is proposed for use in the conclusion of infection, or in the fix, treatment, or aversion of maladies. Accordingly in Implementation of Wireless Systems for Patient Monitoring System, the heartbeat is effectively detected. Heartbeat is estimated utilizing Heartbeat Sensor operational enhancer. Subsequently, the two parameters are shown on an LCD show. At that point both the parameters are transmitted and showed in an inaccessible area. This venture will in the end decrease labor in the exact not so distant future.

6.2 Advantages

- Two inside repaid operation amps in single bundles.
- Eliminates requirement for double supplies
- Allows straightforwardly detecting close GND and VOUT likewise goes to GND
- Compatible with all types of rationale
- Power deplete reasonable for battery task
- Pin-out same as LM1558/LM1458 double operational speaker

6.3 Future Scope

- EEG, ECG and other wellbeing parameters can likewise be observed.
- Continuous observing and future analysis can be performed by means of a similar framework
- More than a solitary patient at better places can be checked utilizing single framework.
- A graphical LCD can be utilized to show a chart of the difference in pulse after some time.
- The most extreme and least pulses over some undefined time frame can be shown
- Serial yield can be connected to the gadget with the goal that the pulses can be sent to a PC for further on the web or disconnected investigation.

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APPENDIX

```
// Programa: Heartbeat Monitoring (MMI)
#include <PulseSensorPlayground.h>
#include <LiquidCrystal.h>
LiquidCrystal lcd(2, 3, 4, 5, 6, 7);
const int PulseWire = 0;
int Threshold = 550;

PulseSensorPlayground pulseSensor;
void setup() {
  lcd.begin(16, 2);
  pulseSensor.analogInput(PulseWire);
  pulseSensor.setThreshold(Threshold);
  if (pulseSensor.begin()) {
    lcd.setCursor(0,0);
    lcd.print(" BPM");
  }
}
void loop() {
  int BPM = pulseSensor.getBeatsPerMinute()
  {
    lcd.setCursor(0,0);
    lcd.print("BPM: ");
    lcd.print(BPM);
  }
  delay(1);
}
```