Footstep Power Generator

Submitted in partial fulfillment of the

requirements for the degree of

Bachelor of Engineering (SEM VIII)

by

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KONKAN GYANPEETH COLLEGE OF ENGINEERING

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Certificate

This is to certify that the project entitled Footstep Power Generator is a Bonafede work of Ahirrao Digvijay (Roll No. 01), Kamble Amit (Roll No. 28), Mishra Prashant (Roll No. 39), Parab Saurabh (Roll No. 42) submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of Undergraduate in Department of Information Technology.

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Declaration

I declare that this written submission represents my ideas in my own words and where other ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Abstract

Man has needed and used energy at an increasing rate, or his sustenance and wellbeing ever since became on the earth a few million years ago due to this a lot of, energy resources have been exhausted and wasted. The most interesting methods, obtaining the energy surrounding a system is to use piezoelectric materials. System is very essential currently to our nation. Non-conventional energy using footstep is converting mechanical energy into the electrical energy. Human race requires energy at very rapid rate for their living and wellbeing from the time of their arrival on this planet, because of this reason power resources have been worn out and enervated. Proposal for the employment and application of extravagant energy in foots of human is very much to the purpose for extremely populated nations like China and India. Where the streets, rail and bus station are over peopled and packed like sardines moving around the clock. So, using such concept the power can be availed and deployed by converting mechanical energy to electrical energy.

The Footstep Power Generation, here we proposed a power generation technique through piezo sense and treadmill stride control generator framework that uses the piezo electric sensors to produce control through strides as a wellspring of sustainable power source that we can get while strolling on a specific course of action like venturing foot on a piezo tile. This venture portrays the utilization of piezoelectric materials keeping in mind the end goal to collect vitality from individuals strolling vibration for producing and amassing the vitality. The essential working standard is based on piezo electric sensors

Acknowledgements

Success is nourished under the combination of perfect guidance, care blessing. Acknowledgement is the best way to convey. We express deep sense of gratitude brightness to the outstanding permutations associated with success. Last few years spend in this estimated institution has molded us into consent and aspiring Engineers. We express our sense of gratitude towards our project guide Prof.J.P.Patil. It is because of his valuable guidance, analytical approach and encouragement that we could learn and work on the project. We will always cherish the great experience to work under their enthusiastic guidance. We are also grateful to our principle Dr.M.J.Lengare who not only supporting us in our project but has also encouraging for every creative activity. We extend our special thanks to all teaching and non- teaching staff, friends and well-wishers who directly or indirectly contributing for the success of our maiden mission. Finally, how can we forget our parents whose loving support and faith in us remains our prime source of inspiration. Lastly, we would like to thank all those who directly and indirectly helping to complete this project. We would also like to acknowledge with much appreciation the crucial role of the staff of Information Technology Department, who gave the permission to use the all required software/hardware and the necessary material to completing to the project.

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Chapter 1: Introduction

This project is used to generate voltage using footstep force. The proposed system works as a medium to generate power using force. This project is very useful in public places like bus stands, theatres, railway stations, shopping malls, etc. So, these systems are placed in public places where people walk, and they must travel on this system to get through the entrance or exists. Then, these systems may generate voltage on each step of a foot. For this purpose, piezoelectric sensor is used in order to measure force, pressure and acceleration by its change into electric signals. This system uses voltmeter for measuring output, led lights, weight measurement system and a battery for better demonstration of the system.

The system generates voltage using footstep force. The system serves as a medium to generate electricity using nonconventional sources(force) and /store/use it. The project is designed to be useful at public places like railway stations where a lot of people keep walking through all day. At such places these systems are to be placed at any entry points where people travel through entrance or exits, and they must step on this device to get through. These devices may then generate a voltage on every footstep and when mounted in series they will produce a sizeable amount of electricity.

1.1 Background

Power assumes a critical part being developed of the Country. Power is characterized as set of physical wonder connected with the stream of charge. There are two sorts of power to be specific Static power, that can be held steady and Dynamic electricity which can spill out of one potential to another.

With the upgrading population and foundation of the forthcoming organizations and production lines there been an awesome interest for the need of power to run the machines and types of gear. Power can spill out of one section to another either as flash or current in metal. Power is created in the power stations by generators. These generators themselves require extensive measure of info energy to deliver power which thus relies on upon the" NONRENEWABLE" assets of vitality to create power with a specific end goal to run them. for example, Solar Cell Panel, Wind Energy can likewise be utilized to collect power. Aside from all their human movements such as nonstop driving of the hand wrenches and little generators can be additionally used to deliver power however all these wonders of producing power requires a consistent human exertion and checking.

When a pedestrian step on the top plate of device, the plate will dip down slightly. The downward movement of the plate results in the rotation of the shaft of an alternator, fitted in the device to produce electrical energy. The top plates revert to its original position due to negating springs provided in the device.

1.2 Objective

The objective of this work is power generation through footsteps as a source of renewable energy that we can obtained while walking onto the certain arrangements like footpaths, stairs, platforms and these systems can be install elsewhere specially in densely populated areas.

The main aim of the project is to develop much cleaner cost-effective way of power generation method, which in turns helps to bring down the global warming as well as reduce the power shortages.

Footstep Power Generation project is used to convert footstep, walking and running energy into electrical energy. The need of electrical energy is increasing day by day. But power generation conventional resources are not enough for a total demand of electrical energy. Therefore, many researchers are working on nonconventional ways of electrical power generation.

Footstep Power Generation system is also a non-conventional electrical energy production system. It converts mechanical energy of footsteps into electrical energy by using transducers. This power generation system can become very popular among country like India. It can be implemented on roads, bus stations, and many public places.

The objective is to implement project using mechanical force through which we can generate electrical energy.

1.3 Purpose

The purpose of this project is to generate electricity using mechanical force. So that the electricity generated can be used in our daily use. It can also be used in public places where it can generate electricity in large scale.

1.3 Scope

Scope of this project are as follows:

- Power generation simply walking on steps.
- Power also generater by running.
- This is a conventional system.

1.3 Applicability/Feasibility Study

A feasibility study is an analysis that takes all a project's relevant fact into account to ascertain the likelihood of completing the project successfully.

Economic Feasibility:

This project is economically feasible. The project can be completed in time and its cost efficient. All the factors like.

- Cost of
- hardware. Cost of maintenance
- Cost of implementation of resources are taken into consideration.

Technical Feasibility:

This assessment is based on an outline design of system requirements, to determine whether the company has the technical expertise to handle completion of the project. When writing a feasibility report, the following should be taken to consideration:

- A brief description of the business to assess more possible factors which could affect the study
- The part of the business being examined
- The human and economic factor
- The possible solutions to the problem

Chapter 2: Literature Survey

- The papers used in this survey discusses the use of piezoelectric material to generate electricity Piezoelectric materials were known as smart materials due to the ability to produce electric potential in response to applied mechanical actions. The materials are expected to become another advantage for automotive industry and also in alternative power generation field. It is shown that with proper configuration, a single piezo-film can generate enough electrical density to be used for any application. The purpose of the study is to generate electricity by using the piezoelectric effects.
- Also, we made the use of LCD Display so as to display the current produced as done in the Arduino Power generating using human footstep paper.
- In the Power Generation Using Piezoelectric & Thermoelectric from Footstep Technique Paper to overcome energy requirements electricity is generated by using biodegradable waste by burning it and also production of electricity with piezoelectric Sensors.

2.1 List of Search Paper

1. Design of sustainable pedestrian power generator using Piezo electric sensors.

2. Arduino power generating using human footstep.

3. Footstep Power Generation: An energy application for rural areas.

4. Power Generation using Piezoelectric & Thermoelectric from Footstep Technique.

2.2 Paper Comparison

Sr.No.	Title	Author Name	Description
1.	Design of sustainable pedestrian power generator using Piezo electric sensors	Muhammad Usaid, Kamlesh Kumar Soothar, Kamran Ali Memon, Sanaullah Dehraj, Usama Hafeez, Noor ul Ain	The generation of electrical power and its utilization is an essential practice. Currently, the energy sources are non-renewable and expensive; the demand for electric power is increasing rapidly
2.	Arduino power generating using human footstep	K.Raju, Bandari Theja, V.V.Ramana Rao	The Footstep Power Generation, here we proposed a power generation technique through piezo sensors. This venture portrays the utilization of piezoelectric materials keeping in mind the end goal to collect vitality from individuals strolling vibration for producing and amassing the vitality.
3.	Footstep Power Generation: An Energy Application for Rural Areas	K. Kranthi Kumar, A. Balachander, Shivani, Mahesh Kumar Katta, Manoj Kumar Gundoji	In this paper we have presented the design methodology of electrical power generation using footstep for urban area energy applications. Man has needed energy at an increasing rate for his sustenance and wellbeing ever since he came on the earth. Due to this lot of energy resource have been exhausted and wasted.
4.	Power Generation Using Piezoelectric & Thermoelectric from Footstep Technique	Saranya L, Divya M, Kalki B, Pavithra P	A foot step power generation technique is designed using piezoelectric sensors and thermoelectric plate. As recent technology is getting developed, the power requirements are also increasing. To overcome that, we use various methods to generate electricity.

Chapter 3: Survey of Technologies

In this chapter we surveyed about various technologies being used in the project. We surveyed about Arduino board and why Arduino Board is used instead of Raspberry Pi and studied deeply about piezoelectric sensors. The programming language used is MC Programming language C and Arduino compiler. The compatible microcontroller for the project is surveyed.

Arduino Board and its importance - Arduino can be powered using a battery pack while it is difficult to power raspberry pi with battery pack. Arduino is cheap while Raspberry pi is expensive. Arduino is best suited for tasks that need sensor data read and reacted to in real time. Also, Arduino has a low power requirement and has very low maintenance requirements. It is ideal for projects that need to be constantly running with little or no interaction. Raspberry Pi, on the other hand, should be considered when the task might need a personal computer to work. The Pi simplifies projects when a lot of operations are required to manage. This could be connecting to the internet to read and write data. It could also include jugging media of any kind or connecting to an external display.

Compatibility of Piezoelectric sensors - Piezoelectric sensors are versatile tools for the measurement of various processes. They are used for quality assurance, process control, and for research and development in many industries. Pierre Curie discovered the piezoelectric effect in 1880, but only in the 1950s did manufacturers begin to use the piezoelectric effect in industrial sensing applications. Since then, this measuring principle has been increasingly used, and has become a mature technology with excellent inherent reliability. They have been successfully used in various applications, in medical, aerospace, nuclear instrumentation, and

as a tilt sensor in consumer electronics or a pressure sensor in the touch pads of mobile phones. In the automotive industry, piezoelectric elements are used to monitor combustion when developing internal combustion engines. The sensors are either directly mounted into additional holes into the cylinder head or the spark/glow plug is equipped with a built-in miniature piezoelectric sensor. Number of piezoelectric materials are available now, even natural and man-made. Natural piezoelectric materials include quartz, cane sugar, Rochelle salt, topaz tourmaline etc. Man-made piezoelectric material includes barium titan ate and zirconated titan ate.

About MC programming language C - Embedded C is most popular programming language in software field for developing electronic gadgets. Each processor used in electronic system is associated with embedded software. These all-device working is based on microcontroller that are programmed by embedded C.

Features of MC programming language C - In embedded system programming C code is preferred over other language. Due to the following reasons:

- Easy to understand
- High Reliability
- Portability
- Scalability

Arduino IDE - Arduino IDE is an open-source software that is mainly used for writing and compiling the code into the Arduino Module.

- It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process.
- It is easily available for operating systems like MAC, Windows, Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment.
- A range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro and many more.
- Each of them contains a microcontroller on the board that is programmed and accepts the information in the form of code.
- The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board.
- The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module.

Chapter 4: Requirements and Analysis

4.1 Problem Definition

To generate electrical energy from the footsteps there are several methods i.e., gear wheel and fly wheel to produce power. These are used in places where there is a lot of people's movement to generate power because the mechanical portion of this will work on the principle. Footstep from crowed on floor and piezo plate scheme that is used below the floor is done for the generation of power, piezo plate will be covered by the sheet and piezo sensor experience a vibrating force by the spring.

4.2 Requirement Specification

1. A piezoelectric sensor is an electric device which is used to measure acceleration, pressure, or force to convert them to an electric signal. These sensors are mainly used for process control, quality assurance, research and development in various industries. The applications of this sensor involve, aerospace, medical, nuclear instrumentation, and as a pressure sensor it is used in the touch pad of mobile phones. In the automotive industry, these sensors are used to monitor ignition when developing internal burning engines.

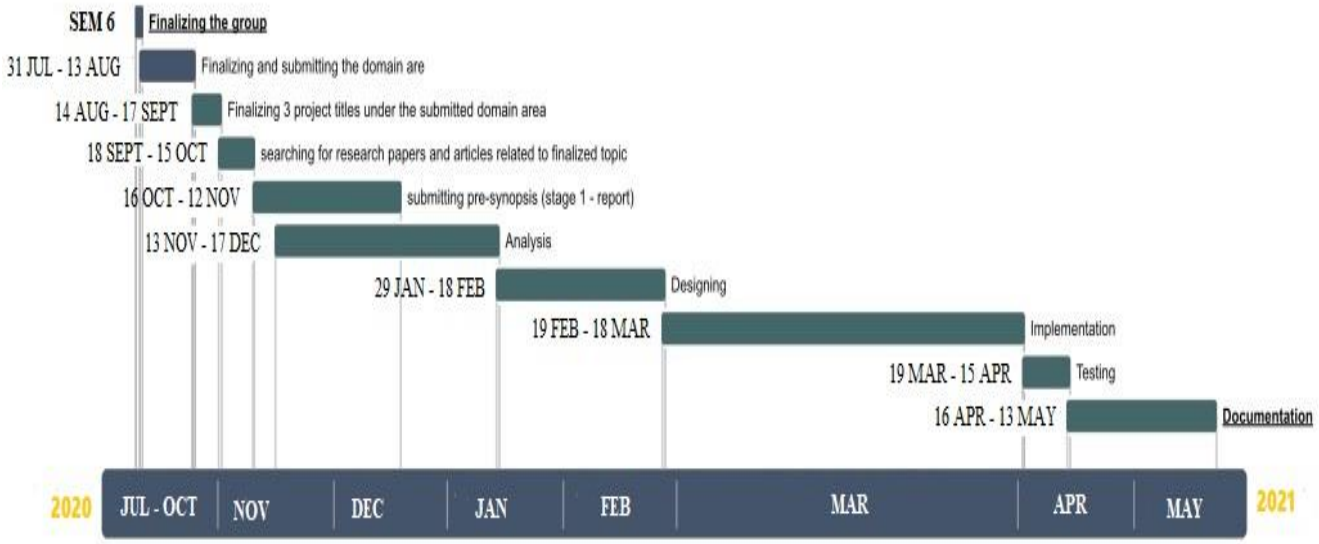
2. Lead battery is most used in PV systems due to low cost and easily available everywhere in the world. These batteries are available in both sealed and wet cell batteries. Lead acid batteries have high reliability due to their capability to withstand overcharge, over discharge & shock. The batteries have excellent charge acceptance, low self-discharge and large electrolyte volume. Lead acid batteries Are tested using Computer Aided Design. These applications of these batteries are used in UPS Systems and Inverter and have the skill to perform under dangerous conditions.

3. This project uses the AT89S52 Microcontroller and Features of this microcontroller includes 8K bytes ROM, 256 bytes RAM 3) 3 Timers, 32 I/O pins, one Serial port, 8 Interrupt sources Here we are using AT89S52microcontroller to display the amount of battery get charged when we place our footstep on piezoelectric sensor.

4. Arduino board is used for connecting microcontroller to the components and for running and executing the code. Arduino is powered using a battery backup.

5. A 16X2 LCD display is used in the footstep power generation project to display the voltage status. It is also provided with a contrast adjusting pin.

Planning and Scheduling



4.3 Software and Hardware Requirement

Hardware requirements

1. Piezoelectric sensor - A piezoelectric sensor is an electric device which is used to measure acceleration, pressure, or force to convert them to an electric signal. These sensors are mainly used for process control, quality assurance, research and development in various industries. The applications of this sensor involve, aerospace, medical, nuclear instrumentation, and as a pressure sensor it is used in the touch pad of mobile phones.

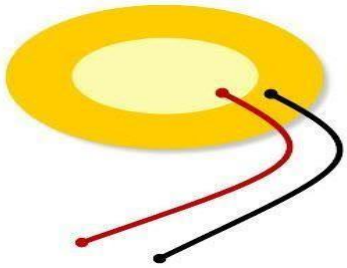


Figure 2: Piezoelectric sensor

2. Microcontroller-This project uses the AT89S52 Microcontroller and Features of this microcontroller includes 8K bytes ROM, 256 bytes RAM, 3 Timers, 32 I/O pins, one Serial port, 8 Interrupt sources Here we are using AT89S52microcontroller to display the amount of battery get charged when we place our footstep on piezoelectric sensor.

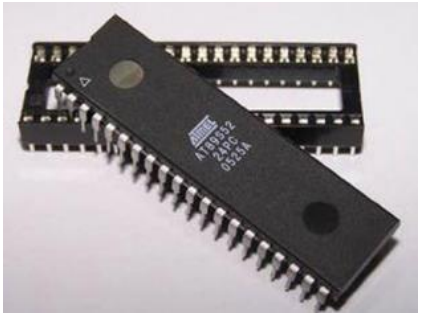


Figure 3: Microcontroller

3. Arduino Board - Arduino board is used for connecting microcontroller to the components and for running and executing the code. Arduino is powered using a battery backup.

Figure 4: Arduino Board

4.16x2 LCD display - A 16X2 LCD display is used in the footstep power generation project to display the voltage status. It is also provided with a contrast adjusting pin.

Figure 5: LCD Display

Software requirements

The **Arduino integrated development environment (IDE)** is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.

The source code for the IDE is released under the GNU General Public License, version 2. 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. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub *main()* into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program *argued* to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

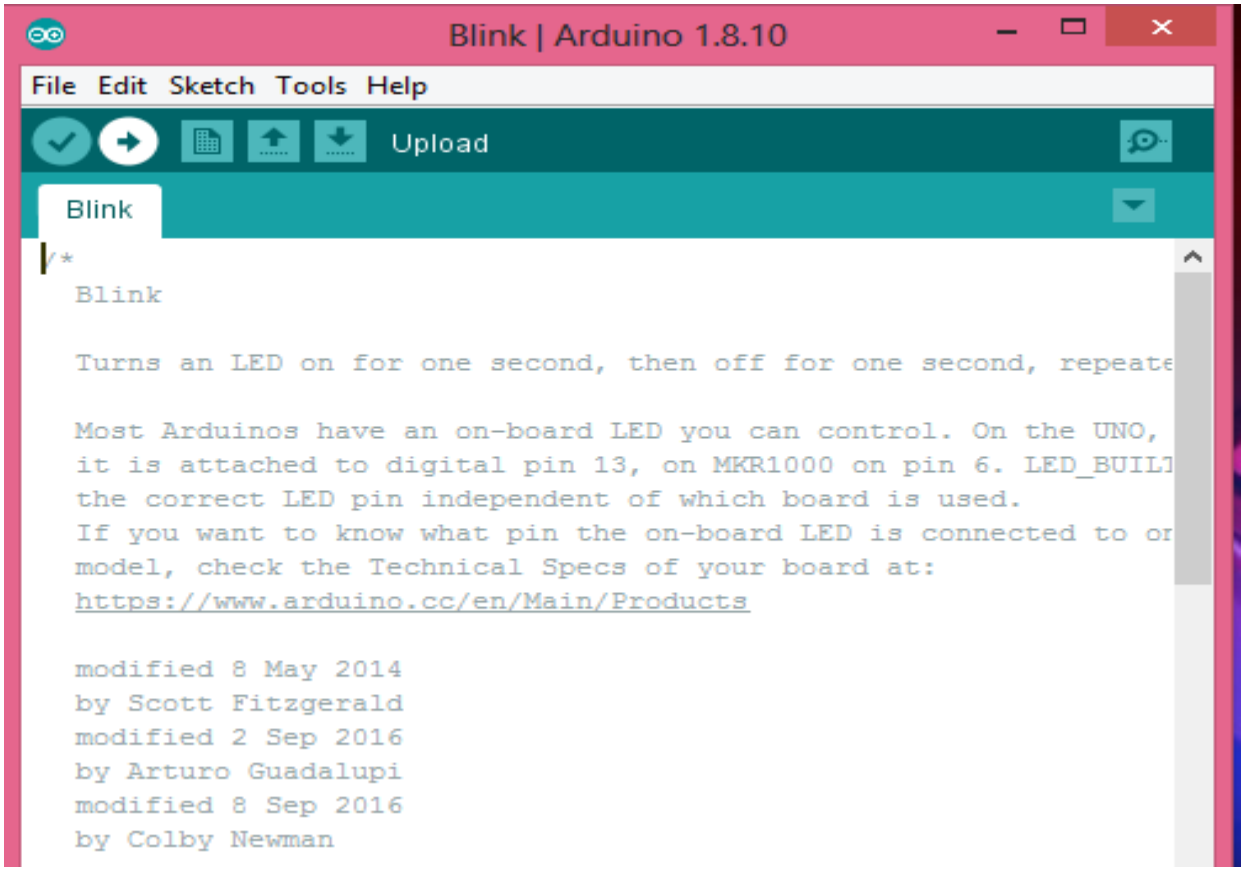


Figure 6: Arduino IDE

2. MC programming language C- Embedded C is most popular programming language in software field for developing electronic gadgets. Each processor used in electronic system is associated with embedded software.

Chapter 5: System Design

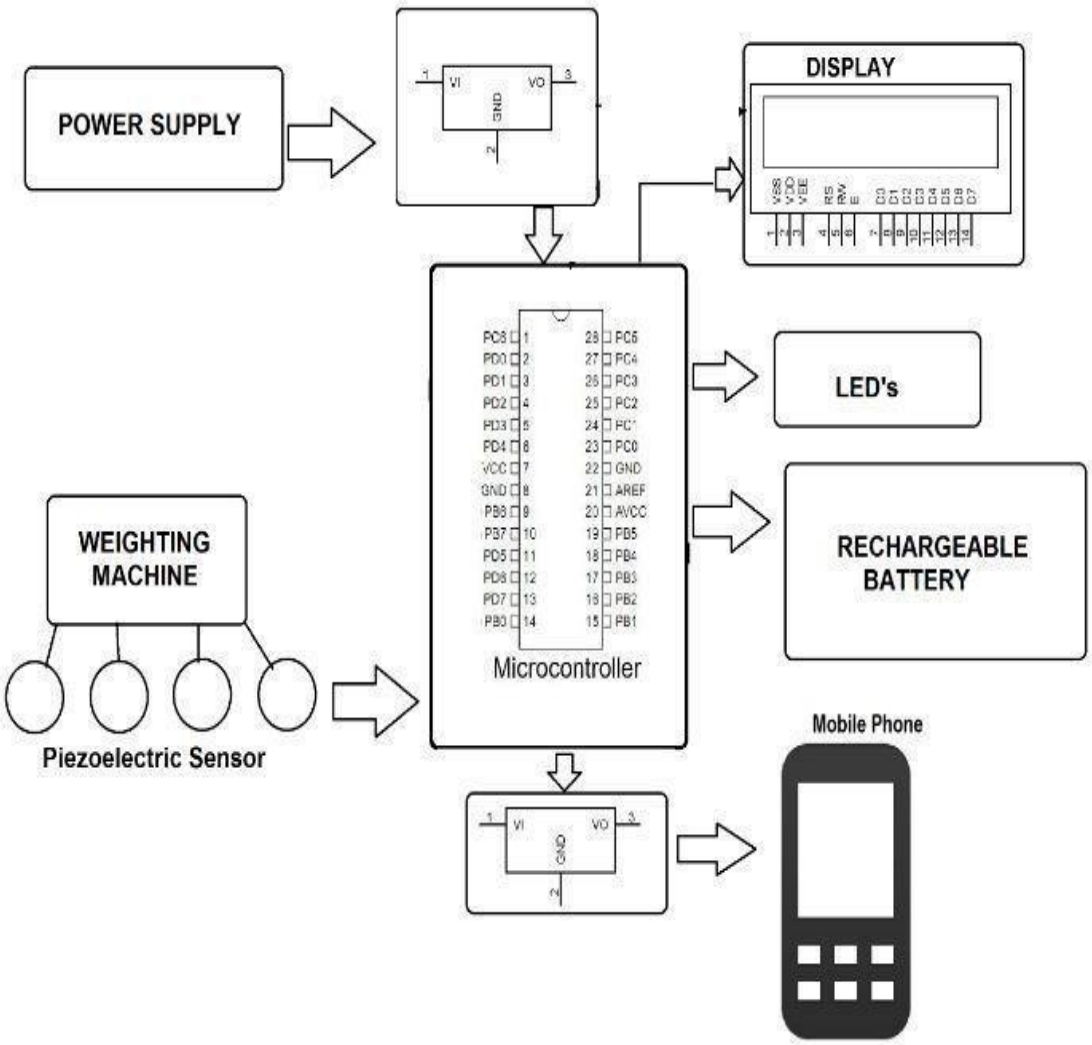


Figure 5.1: Block Diagram

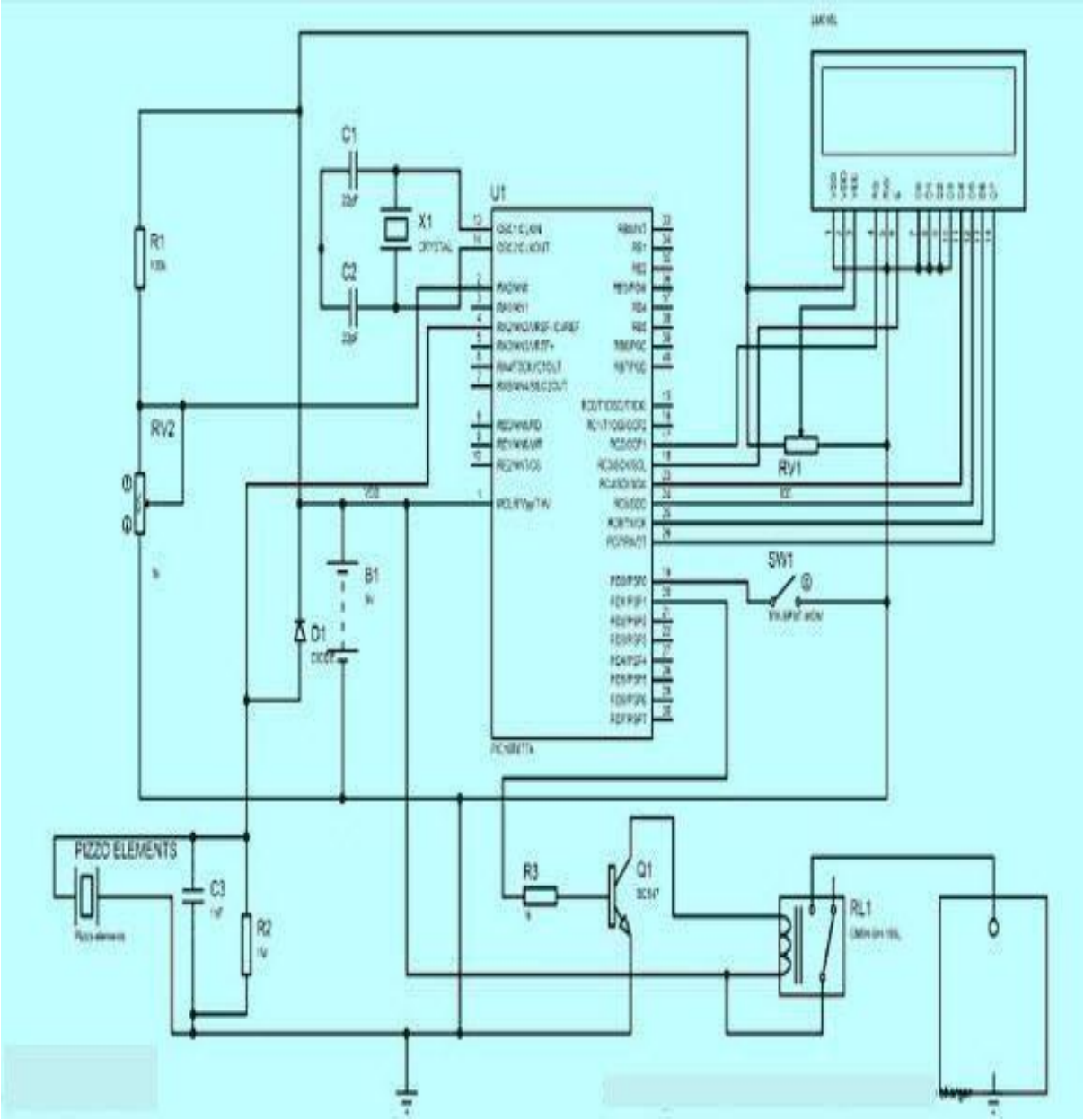


Figure 5.2: Circuit Diagram

5.3 Flowchart

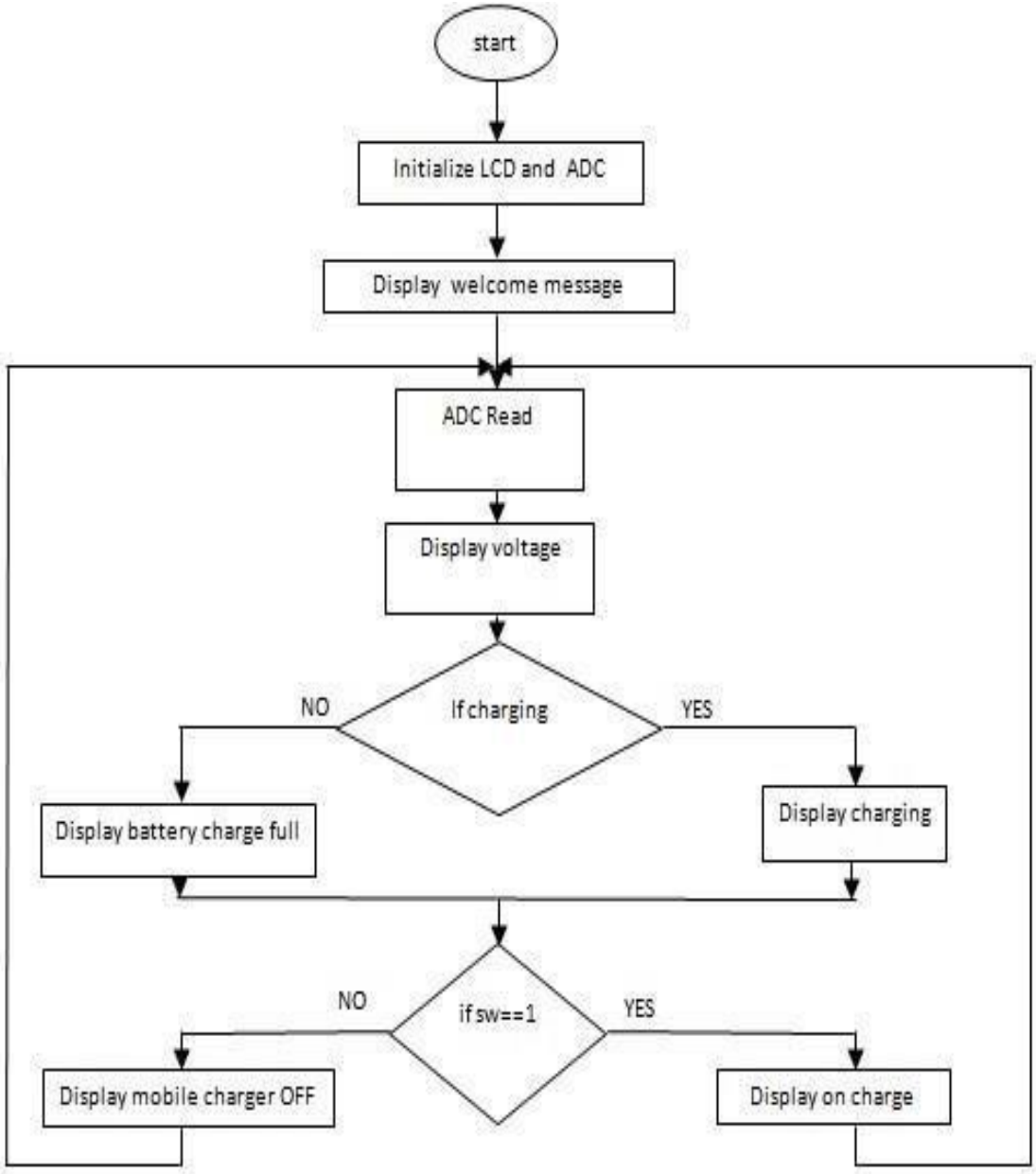


Figure 5.3.1: Flowchart

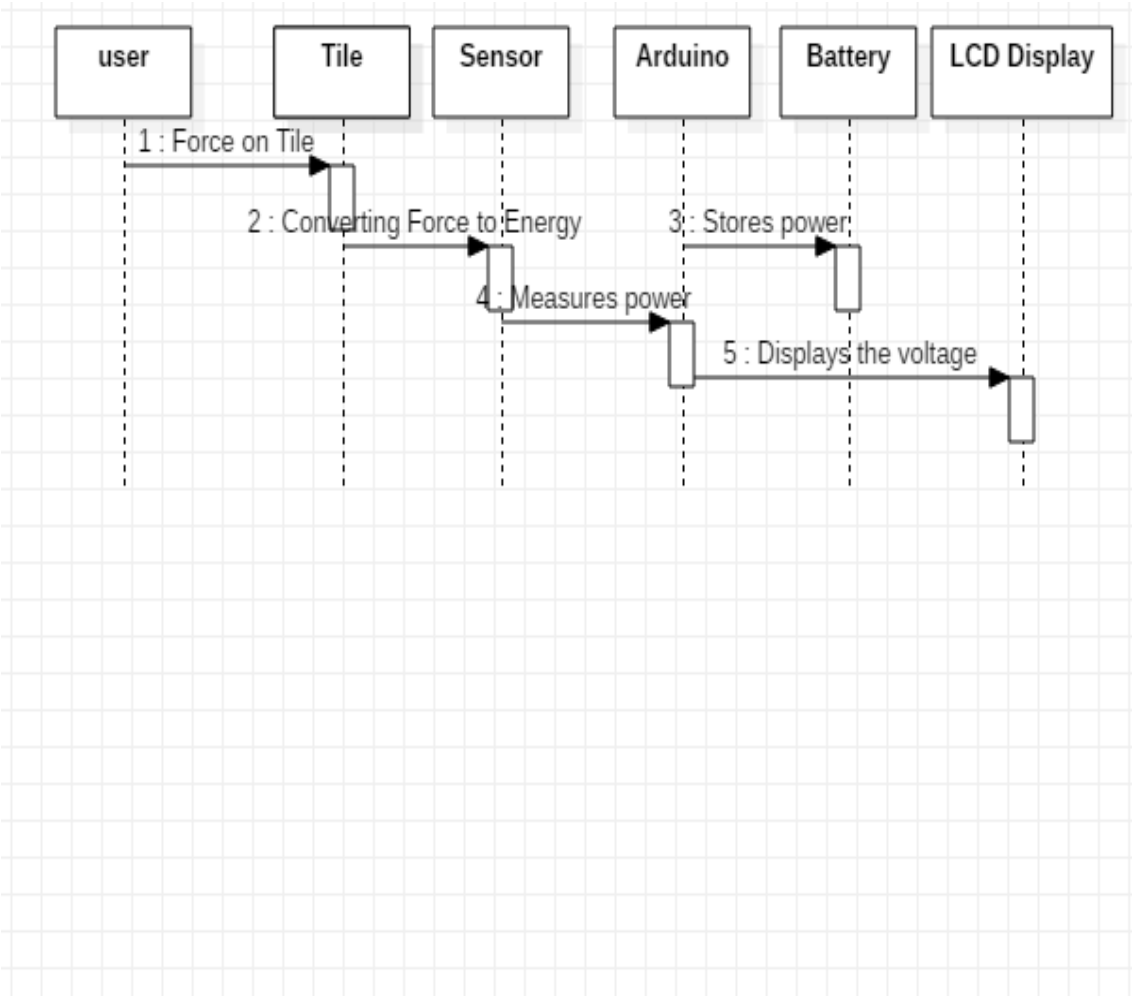


Figure 5.3.2: Sequence Diagram

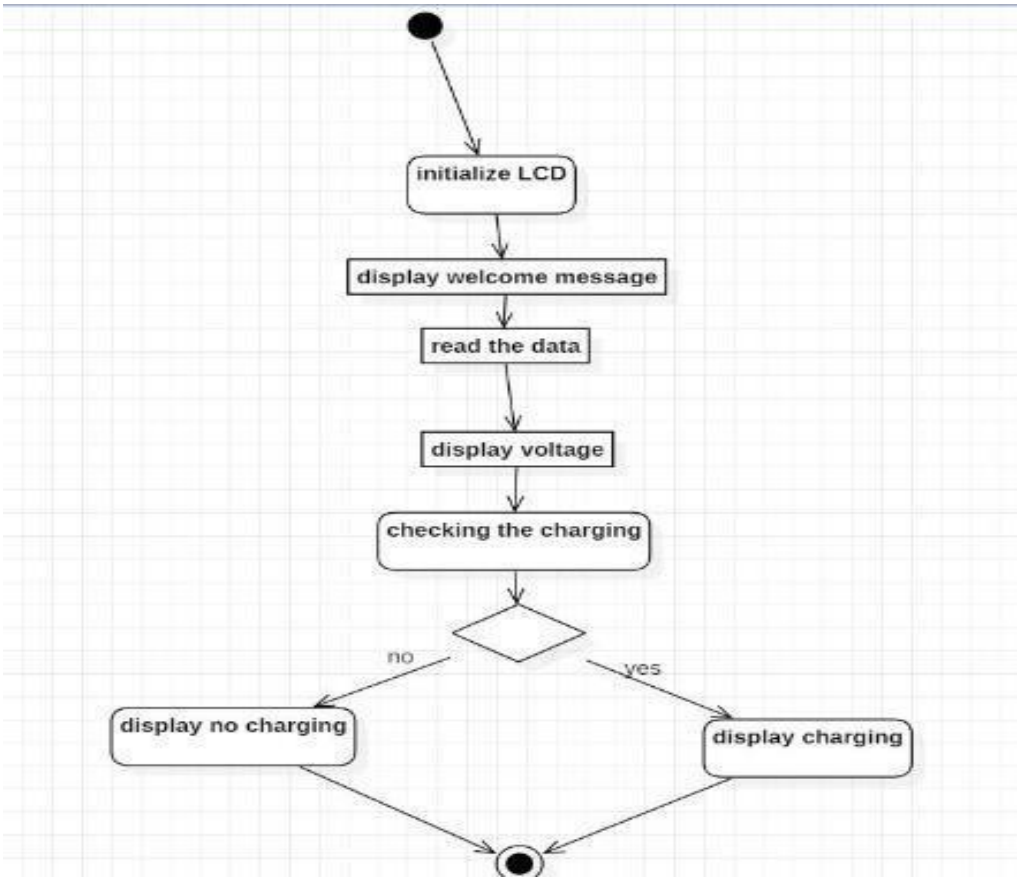


Figure 5.3.3: Activity Diagram

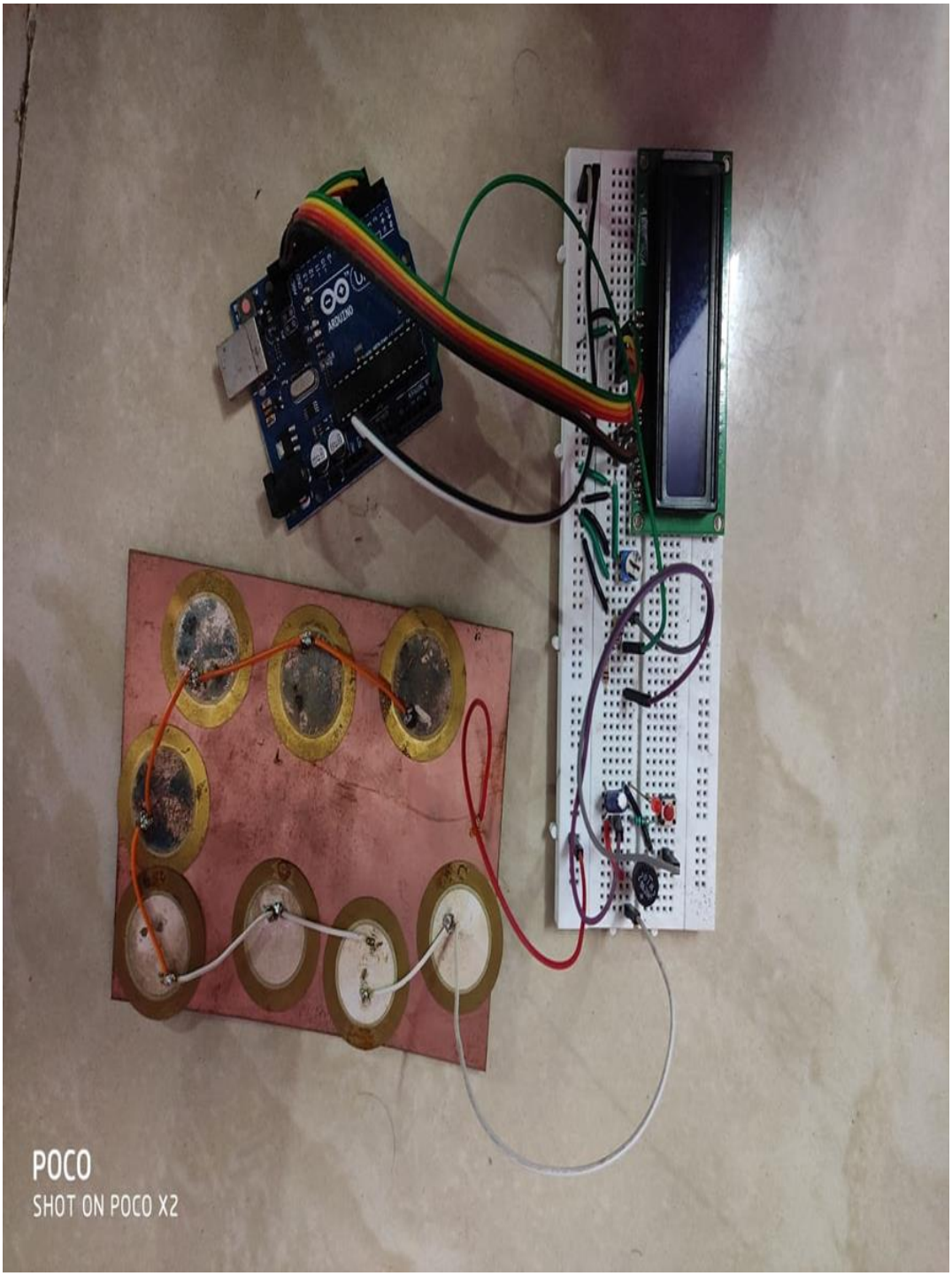
Chapter 6: Implementation and Testing

Implementation Approaches

Sr. No.	Implementation Plan	Action
1.	Module	Arduino Module LCD Display
2.	Percentage Completed	List the Percentage of each module completed.
3.	Status	Module status such as: Completed, On Schedule, Behind Schedule, Cancelled
4.	Day Started	Date module begun
5.	Day to be Completed	Estimated date of module completion.
6.	Actual Completion Date	Date module was completed.
7.	Module Assignment	Name of Module Owner
8.	Importance of Module	Module Priority such as: High, Medium or Low

CODE DETAILS:

```
#include<LiquidCrystal.h>
int analogPin1=A5;
int val = 0;
const int rs =12, en=11, d4=5, d5=4, d6=3, d7=2;
Liquid Crystal 1cd (rs, en, d4, d5, d6, d7);
void setup()
{
pinMode(analogPin1,INPUT);
Serial.begin(9600);
lcd.begin(16,2);
}
void loop()
{
val = analogRead(analogPin1);
float converted = map(val,0,1023,0,5500);
float v = converted/100;
Serial.print("Voltage:");Serial.println(v);
lcd.clear();
lcd.setcursor(0, 1);
lcd.print("voltage:");
lcd.print(v);
delay(100);}
```



Working of Project


VOLTAGE : 2.58

Chapter 7:
Conclusion

The project “Footstep Power Generation” is the best economical affordable energy solution to common people. This can be used for many applications in rural areas where power availability is less or totally absence. As India is a developing country where energy management is a big challenge for huge population. By using this project, we can drive both A.C as well as D.C load according to the force we applied on the piezoelectric sensor.

A Piezo tile capable of generating 40 volts has been devised. Comparison between various piezo electric material shows that PZT is superior in characteristics. Also, by comparison it was found that series-parallel combination connection is more suitable. The weight applied on the tile and corresponding voltage generated is studied and they are found to have linear relation. It is especially suited for implementation in crowded areas. This can be used in street lightning without use of long power lines. It can also be used as charging ports lightning, of pavement side buildings.

As a fact only 11% of renewable energy contributes to our primary energy. If this project is deployed, then not only we can overcome the energy crisis problem, but this also contributes to create a healthy global environmental change.

- Smart system
- Produce 2,000 watts of Electric City
- Durable
- Have a life of approximate five years.

Chapter 8:
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