**FOOT STEP POWER GENERATION**

*Project report submitted*

*In partial fulfillment of the requirement for the degree*

*of*

**Bachelor of Technology**



By

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**(Academic Year–2018-22)**

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I declare that this written submission represents my ideas in my own words and where others' 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 because 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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# RECOMMENDATION

It is hereby recommended that the Project Report entitled “FOOT STEP POWER GENRATION” prepared and submitted by SUMANT KUMAR ARYA, SURAJ KALINDI, SWEETY SHAW, VAISHALI SINGH be accepted in partial fulfillment for the degree of Bachelor of Technology, Electronics and Communication Engineering from the Department Of Electronics, RAMGARH ENGINEERING COLLEGE RAMGARH, JHARKHAND UNIVESITY OF TECHNOLOGY

-

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# APPROVALSHEET

This project report entitled “FOOT STEP POWER GENERATION” by SUMANT KUMAR ARYA, SURAJ KALINDI,SWEETY SHAW,

VAISHALI SINGH is approved for the degree of B.Tech .

**External Examiner**

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# ACKNOWLEDGEMENT

The completion of any project synopsis brings with it a sense of satisfaction, but it is never complete without thanking those people who made it possible and whose constant support has crowned our efforts with success.

We are thankful our guide, Dr. Brajesh Kumar of Electronics and Communication Engineering department& our H.O.D Dr. Sudipta Chakarborty for their expert guidance, encouragement and valuable suggestions at every step.

We also would like to thank all the staff members and lab assistants of E&C dept. for providing us with the all required facilities and support towards the completion of the project.

We would also like to thank our seniors who always helped us to overcome our problems during the course of the project.

We are extremely happy to acknowledge and express our sincere gratitude to our parents for their constant support and encouragement and last but not the least, friends and well-wishers for their help and cooperation and solutions to problems during the course of the project.

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# ABSTRACT

Man has been using energy resources at a very high pace. Due to this a lot of energy resources have been exhausted and wasted.

Proposal for the utilization of waste energy of foot power with human locomotion is quite relevant and important for highly populated countries like India. If this energy made possible for utilization then it will be a great invention.

In this project we are converting non- conventional energy from footstep into an Electrical Energy using Piezo-electric sensor. We will be discussing a bout it in depth in further extension.

Non conventional energy system is very essential at this point to our nation. Non conventional energy using foot step needs no fuel input. The power generation is much worthy but it has little initial cost effective factors.

# CONTENT

|  |  |  |
| --- | --- | --- |
| S.No. | Topic | Page No. |
| 1 | Introduction | 1 |
| 2 | Components description  2.1 Hardware Components:-  2.1.1 Piezo Sensor  2.1.2 TP4056 Battery Module  2.1.3 ESP8266 Module  2.1.4 Li-ion Battery  2.1.5 Bridge Rectifier  2.1.6 Diode  2.1.7 LED  2.18 Capacitor  2.2 Software used:-  2.2.1 ThingSpeak  2.2.2 Arduino IDE  2.2.3 Proteus | 2  2  3-4  4-5  5-7  7  8  9  10  10  11  12  13 |
| 3 | Algorithmic Flowchart | 14 |
| 4 | Simulation and Working | 15 |
| 5 | Implementation  5.1 Code | 16  17-20 |
| 6 | Observation | 21 |
| 7 | Application  7.1 Advantages  7.2 Limitations | 22 |
| 8 | Conclusion and Future Scope  8.1 Conclusion  8.2 Future Scope | 23 |
| 9 | References | 24 |

1. **INTRODUCTION**

As the availability of conventional energy declines, there is need to find alternate energy sources. The Power produced by most of the states electricity are insufficient to meet even domestic utilities, in such situation it is very difficult to divert the energy for other public needs.

So an alternative source must be discovered, many proposed Solar Energy but it would be a costliest affair and also unavailability of solar energy in winter and rainy season makes it in dependable.

Hence an alternative cheapest method must me choosen. So this project has been taken up, which aimed to generate electricity with Footstep Mechanism. Here the concept used is to convert Mechanical Energy to Electrical energy using Piezo sensors andESP2886.

Out of various energy resources, the technology described in this project is safe and pollution free. Thus it will be an extremely viable alternative in coming days.

# COMPONENTSDESCRIPTION

## Hardware components

* + 1. Piezo sensor
    2. TP4056Battery module
    3. ESP8266 Module
    4. Li-ion Battery
    5. Bridge Rectifier
    6. Diode
    7. Led
    8. Capacitor

## Software used

* + 1. ThingSpeak
    2. Arduino IDE
    3. Proteus

#### PIZEOSENSOR

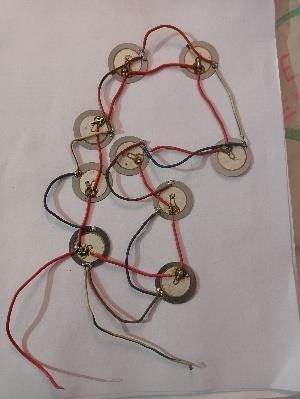


Fig2.1.1.1:-Connected pizeo sensor

Piezoelectric force sensors are low impedance voltage force sensors designed for generating analog voltage signals when a force is applied on the piezoelectric crystal and are widely usedinmachinesformeasuringforce.Apiezoelectricpressuresensorisalsoknownasapiezoelectric sensor pressure. Piezoelectric transducers operate based on the piezo electric effect. This effect happens when a polarized crystalline material undergoes stress order formation. The stress then causes a shift in the orientation of the internal dipoles of the material. It is similar to di-electricity, which occurs when a charge is produced from a shift of electrons in an insulator. Figure 2.1.1.2 below illustrates this effect. In an electrical schematic diagram, a piezoelectric force sensor appears as a charge source in series with a capacitance that has an internal resistance and inductance. Fig 2.1.1.1 below depicts this electrical model. A piezo electric force transducer is simply a sensor that detects an applied force, deforms under this force, and then generates an electrical signal at its output terminals. This electrical output signal is in the form of electric charges that are proportional to the applied force. Piezoelectric transducers operate based on the piezoelectric effect. This effect happens when a polarized crystalline material undergoes stress or deformation. The stress then causes a shift in the orientation of the internal dipoles of the material. It is similar to di-electricity, which occurs when a charge is produced from a shift of electrons in an insulator. Figure 2.1.1.1 below illustrates this effect. In an electrical schematic diagram, a piezoelectric force sensor appears as a charge source in series with a capacitance that has an internal resistance and inductance.Figure2.1.1.2 below depicts this electrical model.

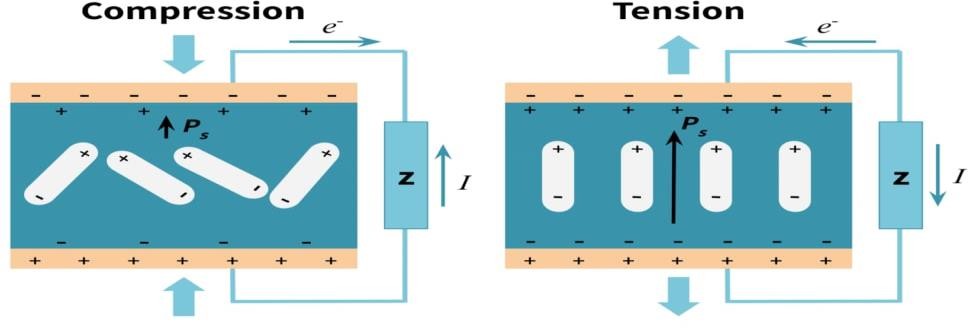


Fig2.1.1.2:-Internal mechanism of Piezo-electric sensor

#### TP 4056 Battery module

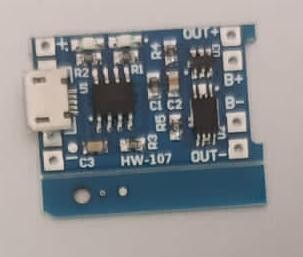


Fig2.1.2.1:-TP4056

The TP4056 chip is a lithium Ion battery charger for a single cell battery, protecting the cell from over and under charging. It has two status outputs indicating charging in progress, and charging complete. You can use it to charge batteries directly from a USB port since the working input voltage range is 4V~8V. The TP4056 3.7V li-ion 18650 battery charger module pinout, datasheet & details about this module. TP4056 charging module is a small size li-ion battery charger module. This module uses one IC and few discrete to make a high quality charging module that can provide the required charging procedure to li-ion battery which makes the battery life long and charge it effectively and to its full extent due to which the battery provides its full backup.

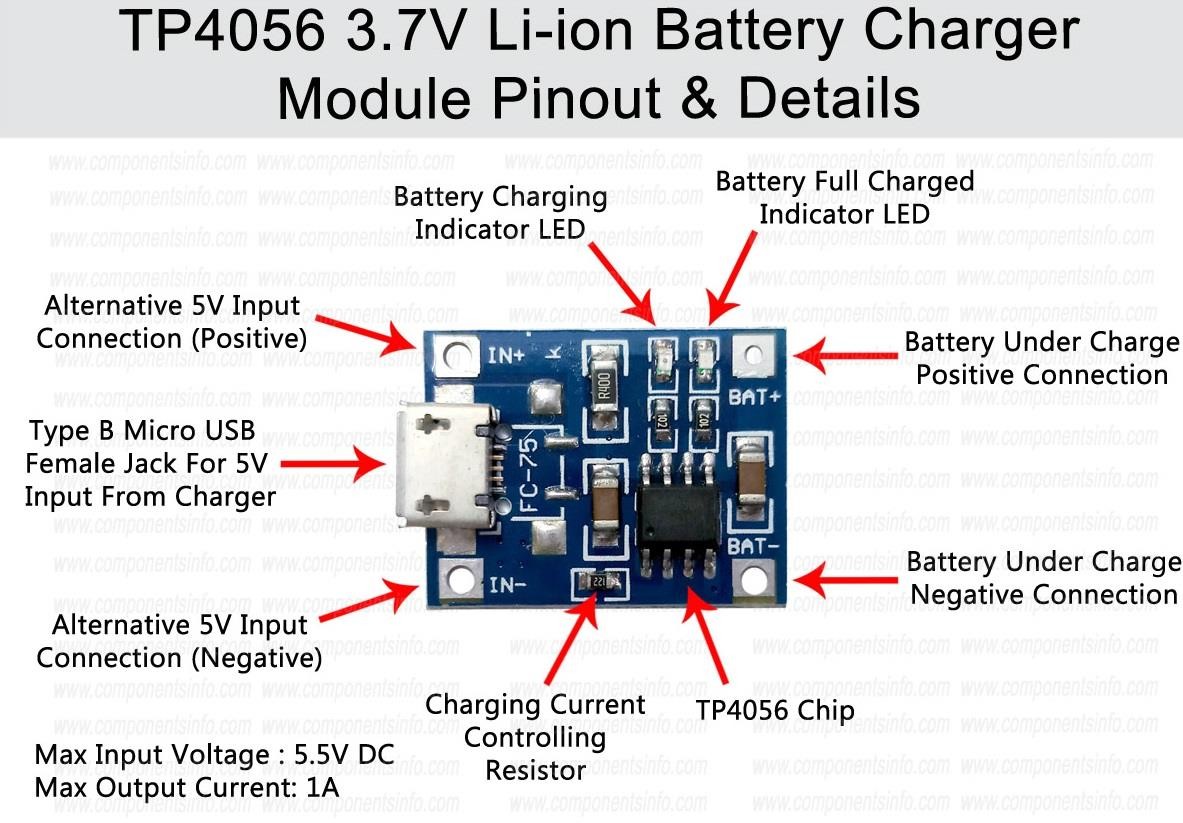


Fig2.1.2.2:-TP Module Pinout and Details

#### ESP8266Platform

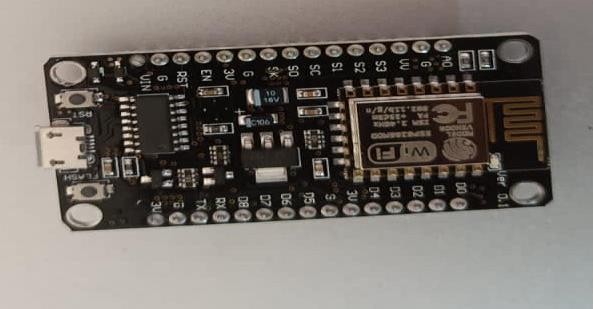


Fig2.1.3.1:-ESPModule

The ESP8266 Serial WIFI Wireless Transceiver Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions for other application processor.

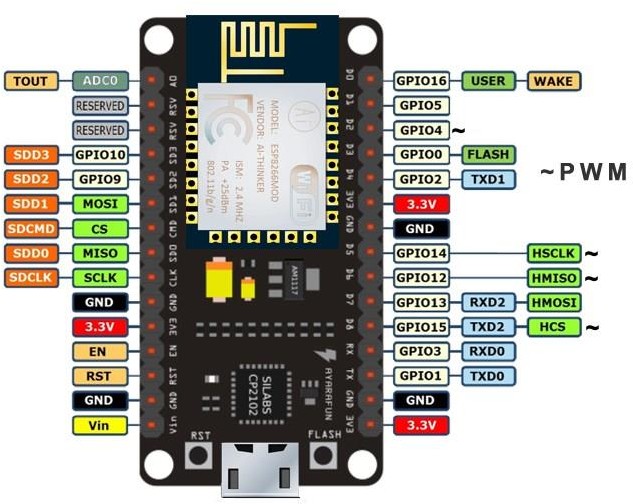


Fig2.1.3.2:-ESP Pin Description

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pin Number | PinName | AlternateName | Normally used for | Alternate purpose |
| 1 | Ground | - | Connected to the ground of the circuit | - |
| 2 | TX | GPIO–1 | Connected to Rx pin of programmer/uC to upload program | Can act as a General purpose Input/output pin when not used as TX |
| 3 | GPIO-2 | - | General purpose Input/output pin | - |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 4 | CH\_EN | - | Chip Enable–Active high | - |
| 5 | GPIO–0 | Flash | General purpose Input/output pin | Takes module into serial programming when held low during startup |
| 6 | Reset | - | Resets the module | - |
| 7 | RX | GPIO–3 | General purpose Input/output pin | Can act as a General purpose Input/output pin when not used as RX |
| 8 | VCC | - | Connectto+3.3Vonly |  |

Table2.1.3.1:-PIN DESCRIPTION

#### Li-ion Battery



Fig2.1.4.1:-Li-ion Battery

Lithium-ion battery or Li-ion battery is a type of rechargeable battery composed of cells in which lithium ions move from the negative electrode through an electrolyte to the positive electrode during discharge and back. The movement of the lithium ions creates free electrons in the anode which creates a charge at the positive current collector. The electrical current then flows from the current collector through a device being powered (cell phone, computer, etc.) to the negative current collector.

#### Bridge Rectifier



Fig2.1.5.1:-Bridge Rectifier

A Bridge Rectifier is an arrangement of four diodes in a bridge circuit configuration that provides the same polarity of output for either polarity of input. When used in its most common application, for conversion of an alternating-current input into a direct-current output, it is known as a bridge rectifier.

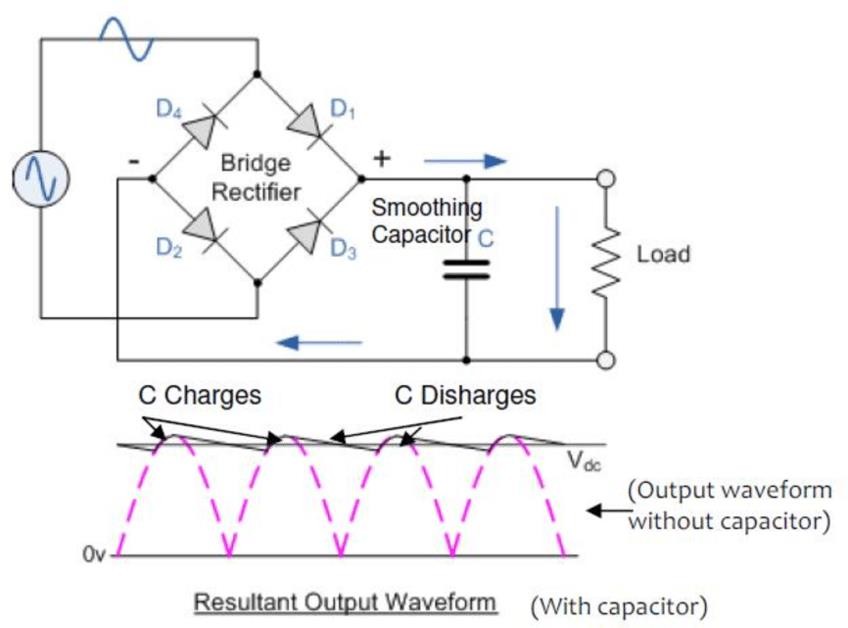


Fig2.1.5.2:-AC input ,we get DC wavefrom

#### Diode



Fig2.1.6.1:-Diode

A Diode is a semiconductor device that essentially acts as a one-way switch for current. It allows current to flow easily in one direction, but severely restricts current from flowing in the opposite direction.

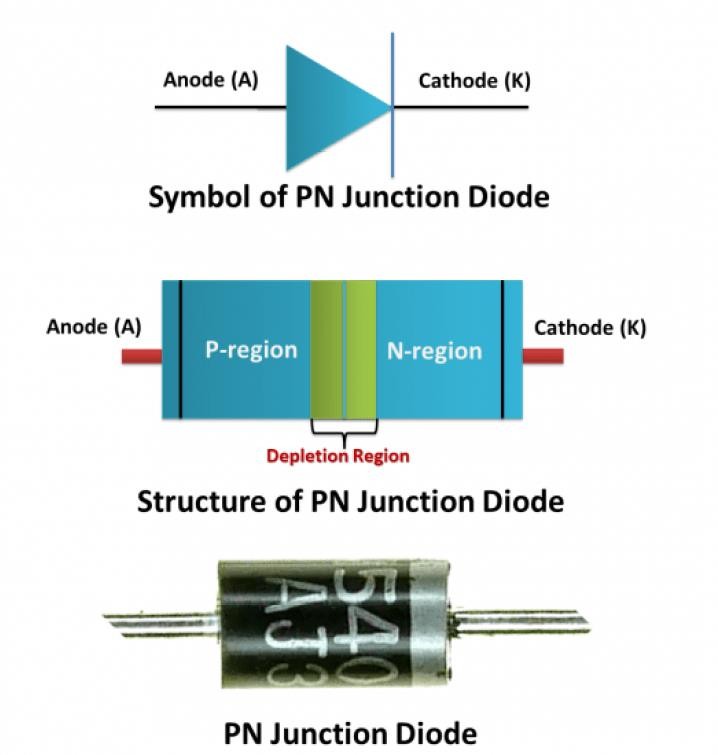


Fig2.1.6.2:-Diode Figure in Details

#### LED



Fig2.1.7.1:-LED

A light-emitting diode (LED) is a semiconductor device that emits light when an electric current flows through it. When current passes through an LED, the electrons recombine with Fig2.1.5.1 holes emitting light in the process. LED sallow the current to flow in the forward direction and blocks the current in the reverse direction. Light-emitting diodes are heavily doped p-n junctions. Based on the semiconductor material used and the amount of doping, an LED will emit a coloured light at a particular spectral wavelength when forward biased. As shown in the figure, an LED is encapsulated with a transparent cover so that emitted light can come out.

#### Capacitor



Fig2.1.8.1:-Capacitor

A capacitor is a device that stores [electrical energy](https://en.wikipedia.org/wiki/Electrical_energy) in an [electric field](https://en.wikipedia.org/wiki/Electric_field). It is a [passive](https://en.wikipedia.org/wiki/Passivity_(engineering)) [electronic](https://en.wikipedia.org/wiki/Electronic_component) [component](https://en.wikipedia.org/wiki/Electronic_component) with two [terminals](https://en.wikipedia.org/wiki/Terminal_(electronics)). The effect of a capacitor is known as [capacitance](https://en.wikipedia.org/wiki/Capacitance). While some capacitance exists between any two electrical conductors in proximity in a [circuit](https://en.wikipedia.org/wiki/Electric_circuit), a capacitor is a component designed to add capacitance to a circuit. The capacitor was originally known as **condenser.**

#### ThingSpeak

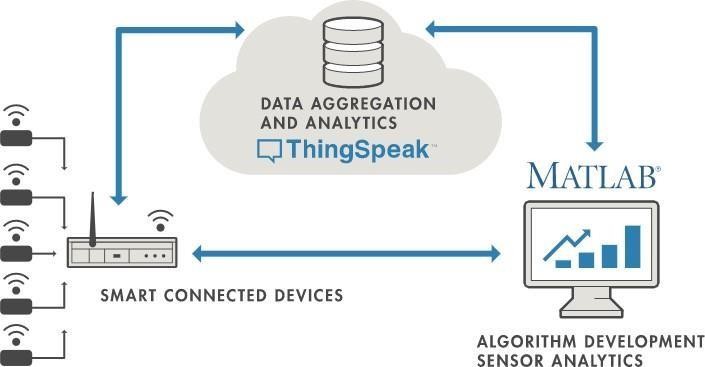


Fig2.2.1.1:-ThingSpeak

ThingSpeak is an IoT analytics platform service that allows you to aggregate, visualize, andanalyze live data streams in the cloud. You can send data to ThingSpeak from your devices, create instant visualization of live data, and send alerts. ThingSpeak provides instant visualizations of data posted by your devices to ThingSpeak. With the ability to execute. ThingSpeak you can perform on line analysis and processing of the data as it comes in. ThingSpeak is often used for proto typing and proof of concept IoT systems that require analytics.

ThingSpeak Key Features.

Thing Speak allows you to aggregate, visualize and analyze live data streams in the cloud. Some of the key capabilities of Thing Speak include the ability to:

* + - * Easily configure devices to send toThingSpeak using popular IoT protocols.
      * Visualize your sensor data in real-time.
      * Aggregate data non-demand from third-party sources.
      * Use the power of MATLAB to make sense of your IoT data.
      * Run your IoT analytics automatically based on schedules or events.
      * Prototype and build IoT systems without setting up servers or developing web Software.

#### Arduino IDE

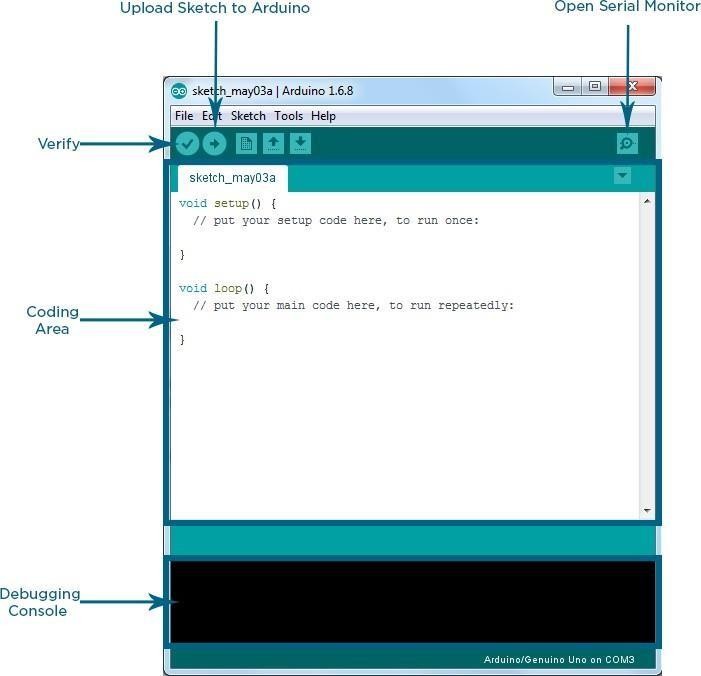


Fig2.2.2.1:-Platform for IDE code

Arduino IDE**,** where IDE stands for Integrated Development Environment official software introduced by Arduino that is mainly used for writing, compiling and uploading the code in almost all Arduino modules/boards. It is available for all operating systems i.e. MAC, Windows, Linux and runs on the Java Platform that comes within built functions and commands that play a vital role in debugging, editing and compiling the code .A range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro and many more. Each of the contain same microcontroller on the board that is actually programmed and accepts the in formation in the form of code. The main code, also known as a sketch, created on the IDE platform will ultimately generate Hex File which is the 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.

#### Proteus

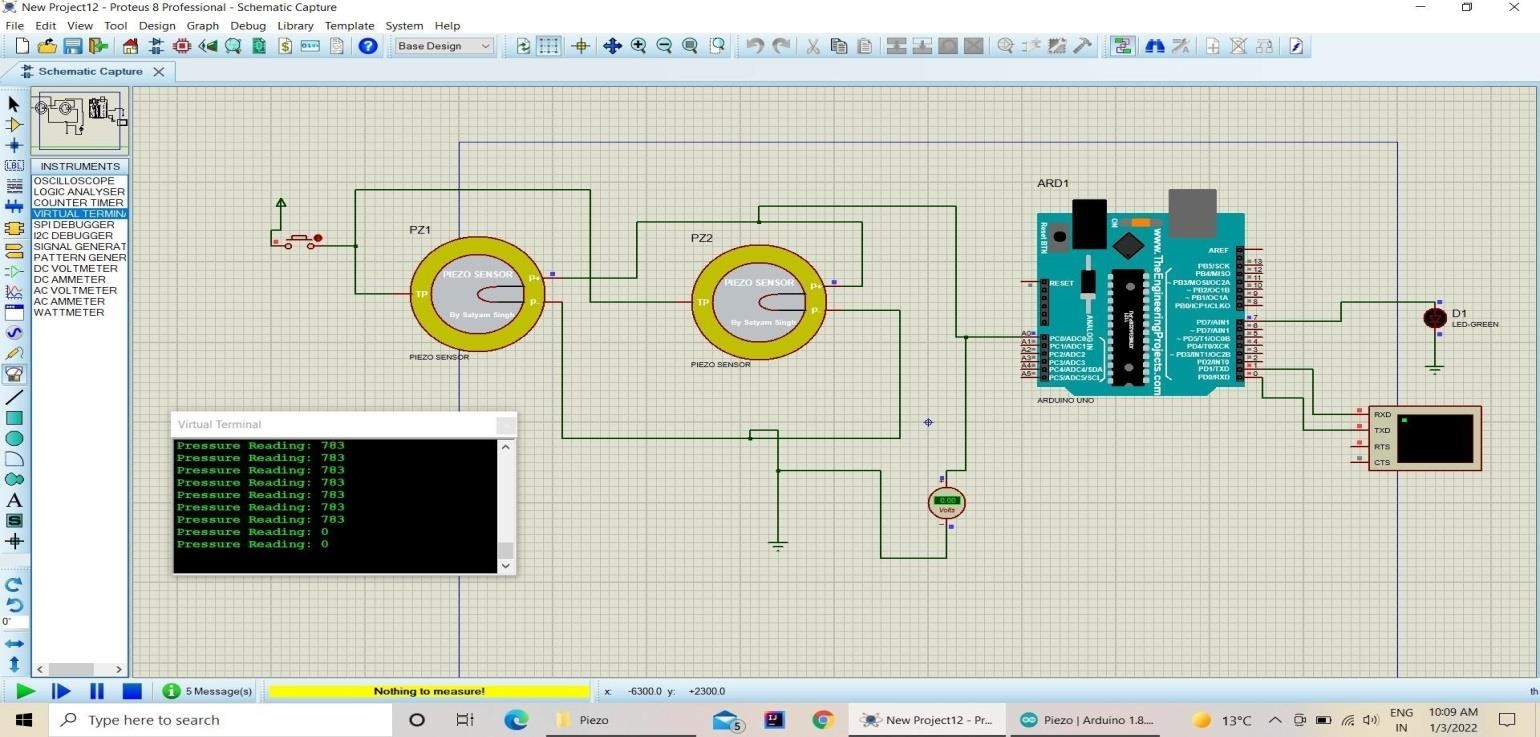
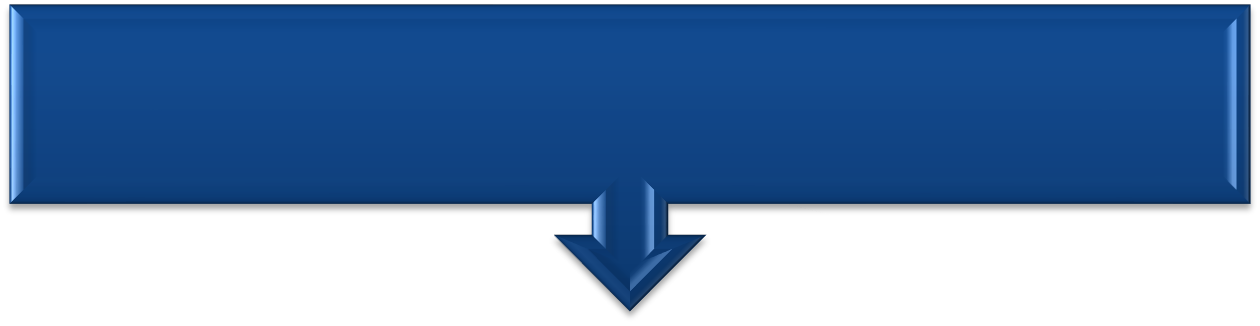
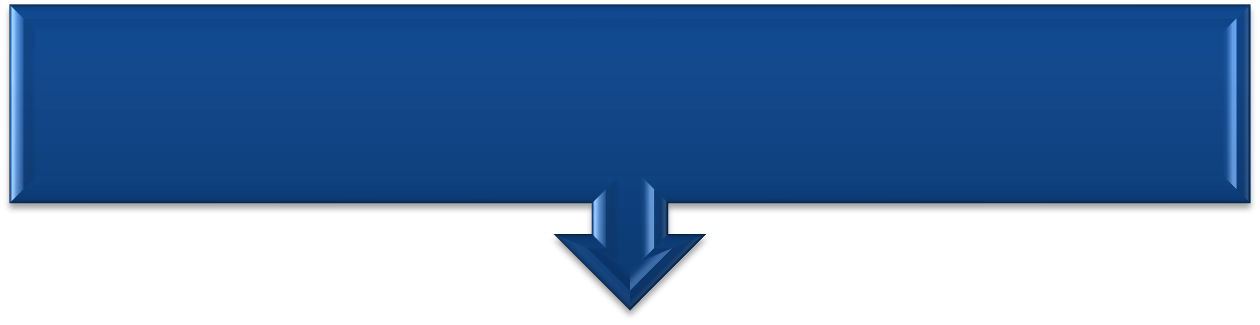
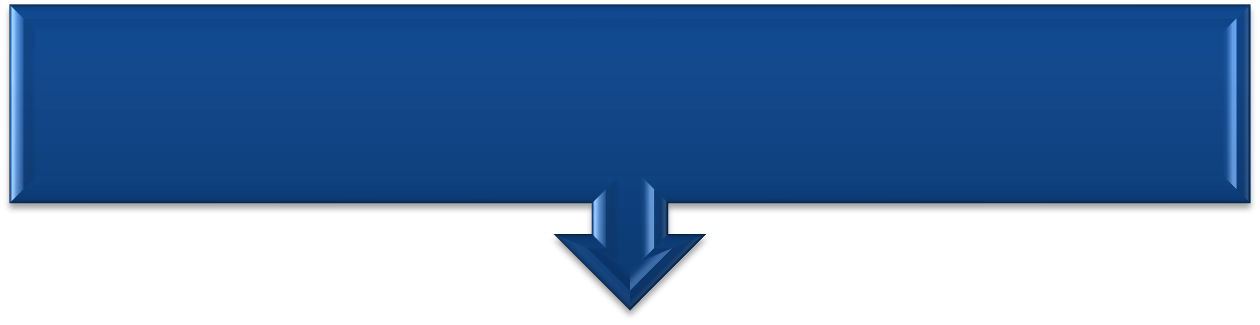
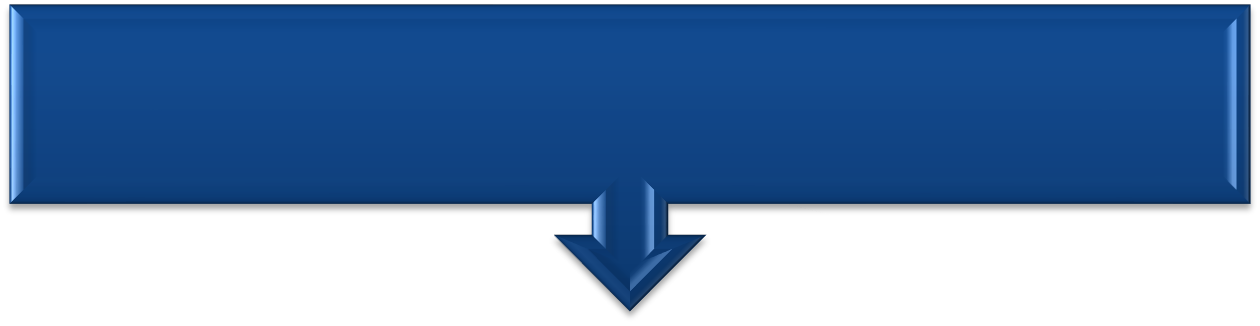


Fig2.2.3.1:-Proteus Platform

Proteus Design Suite (designed by Lab center Electronics Ltd.) is a software tool set, mainly used for creating schematics, simulating Electronics & Embedded Circuits and designing PCB Layouts. Proteus ISIS is used by Engineering students & professionals to create schematics & simulations of different electronic circuits. Proteus is quite lenient in circuit designing and it works on ideal conditions i.e. if you don’t add pull up resistors in Proteus simulation, the nit won’t give garbage value. Proteus is a l so used for designing/ testing programming codes for different Microcontrollers i.e. Arduino, PIC Microcontroller, 8051 etc.

# ALGORITHMIC FLOW CHART



Piezoelectric Pressed

Current Generated

Bridge Rectifier AC to DC

TP Module sends battery state to ESP

ESP Module sends data to thinkspeak

1. **SIMULATION AND WORKING**

The basic working principle of our project is based on the piezo electric effect. Non-conventional energy using footstep is converting mechanical energy into the electrical energy. Foot step board consists of 9 piezoelectric sensors which are connected in parallel. When the pressure is applied on the sensors, these sensors will convert mechanical energy into electrical energy. This electrical energy will be stored in the 12V rechargeable battery connected. We are using conventional battery charging unit also for giving supply to the circuitry. An inverter is used to convert the 12 Volt D.C to the 230 Volt A.C. This 230 Volt A.C voltage is used to activate the loads. By using this AC voltage we can operate AC loads in this we use the Battery Monitoring System, we will use Wemos D1 Mini with ESP8266 Chip to send the battery status data to Thing to Speak cloud. The Thing to speak will display the battery voltage along with battery percentage in both the charging and discharging cases.

#### Simulation:-

Fig4.1:-On pressing Pezeo sensor voltage is generated and led is glowing.

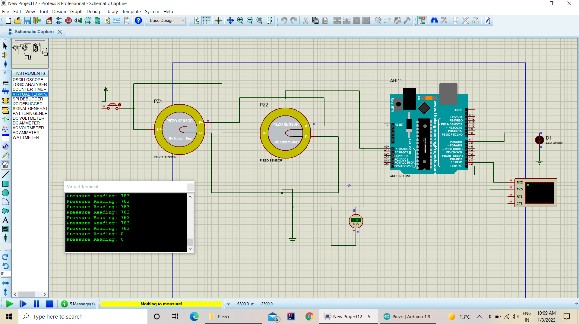


Fig4.2:-When sensor is not pressed no power is generated and led is in off state.

# IMPLEMENTATION

This is the hardware set of project.

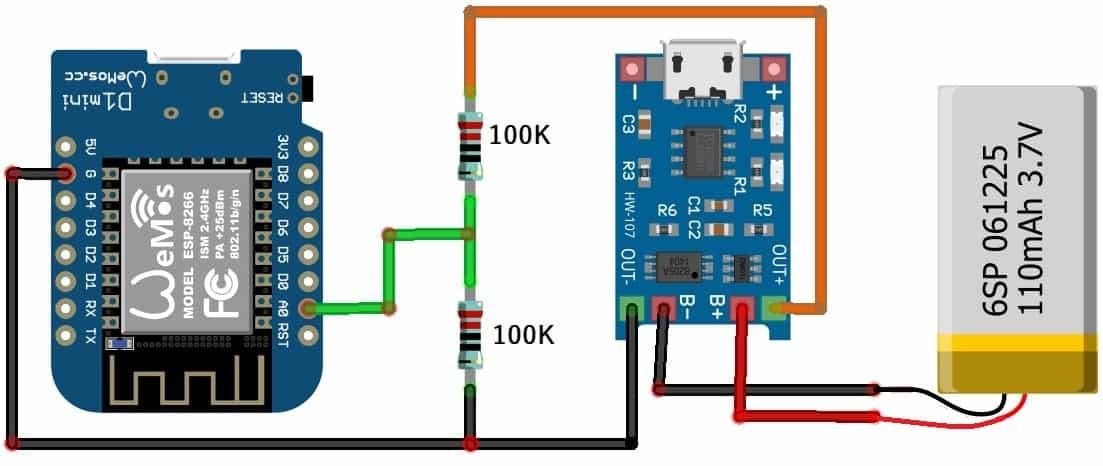


Fig5.1:-Hardware we suppose to do.

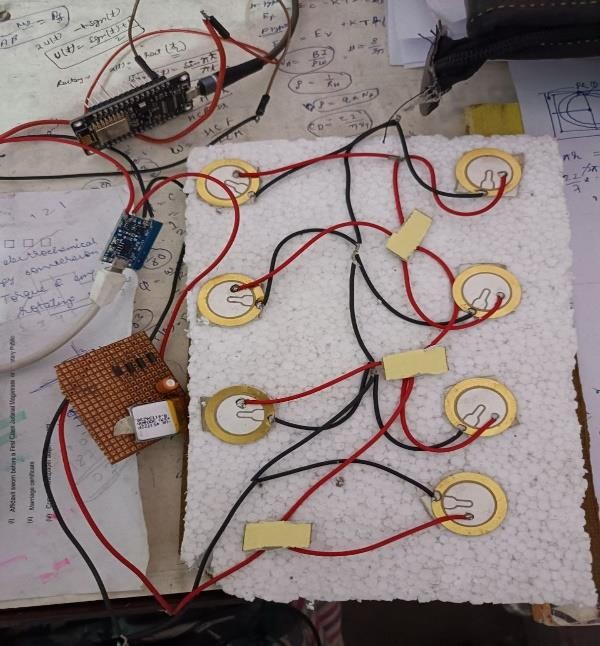


Fig5.2:-Hardware Implemented.

#### Code:

#include<ESP8266WiFi.h>

String api Key="HXWBVA3NC7LCFEWY";

Const char\*ssid = "Redmi"; // Enter your WiFi Network's SSID const char\*pass="ankit123";//EnteryourWiFiNetwork'sPasswordconst char\*server ="api.thingspeak.com";

Int analogInPin=A0; //Analoginputpin

Int sensorValue; // AnalogOutputofSensor

float calibration=0.36;//CheckBatteryvoltageusingmultimeter&add/subtractthevalueint bat\_percentage;

WiFiClient client; void setup()

{

Serial.begin(115200);

Serial.println ("Connectingto"); Serial.println(ssid); WiFi.begin(ssid,pass);

While (WiFi.status()!=WL\_CONNECTED)

{

delay(100); Serial.print("\*");

}

Serial.println(""); Serial.println("WiFiconnected");

}

Void loop()

{

Sensor Value=analog Read(analogInPin);

Float voltage=(((sensorValue\*3.3)/1024)\*2+calibration); //multiply by two as voltage divider network is 100K&100K Resistor

bat\_percentage=mapfloat(voltage,2.8,4.2,0,100);//2.8VasBatteryCutoffVoltage&4.2Vas Maximum Voltage

if (bat\_percentage>=100)

{

bat\_percentage=100;

}

If (bat\_percentage<=0)

{

bat\_percentage=1;

}

Serial.print("Analog Value = "); Serial.print(sensorValue);

Serial.print("\t Output Voltage = "); Serial.print(voltage);

Serial.print("\t Battery Percentage = "); Serial.println(bat\_percentage); delay(1000);

if(client.connect(server,80))

{

String postStr = apiKey; postStr += "&field1="; postStr += String(voltage); postStr+="&field2=";

postStr+=String(bat\_percentage); postStr+="\r\n\r\n";

client.print("POST /update HTTP/1.1\n"); delay(100);

client.print("Host: api.thingspeak.com\n"); delay(100);

client.print("Connection: close\n"); delay(100);

client.print("X-THINGSPEAKAPIKEY: " + apiKey + "\n"); delay(100);

client.print("Content-Type:application/x-www-form-urlencoded\n");

delay(100); client.print("Content-Length: "); delay(100); client.print(postStr.length()); delay(100);

client.print("\n\n"); delay(100); client.print(postStr); delay(100);

}

client.stop(); Serial.println("Sending ");

delay(15000);

}

Float map float(floatx,floatin\_min,floatin\_max,floatout\_min,floatout\_max)

{

return (x-in\_min)\*(out\_max -out\_min)/(in\_max -in\_min)+out\_min;

}

# OBSERVATION

|  |  |  |
| --- | --- | --- |
| **Day** | **Analog value** | **Battery status** |
| 01 | 10 | 0.42 V,4%charge |
| 02 | 64 | 0.77V,10%charge |
| 03 | 70 | 0.81V,20%charge |

Table6.1:-Observation Table

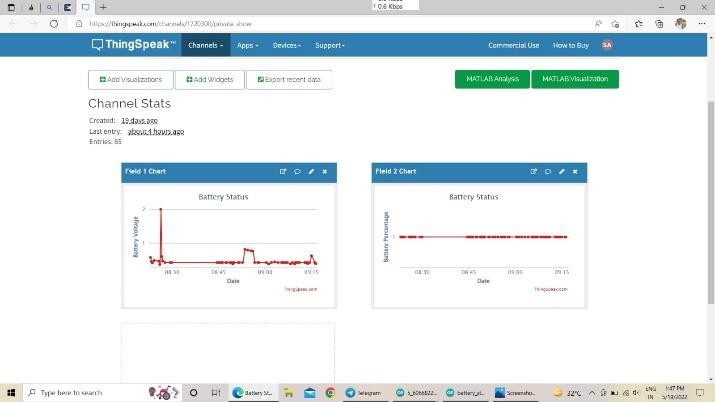
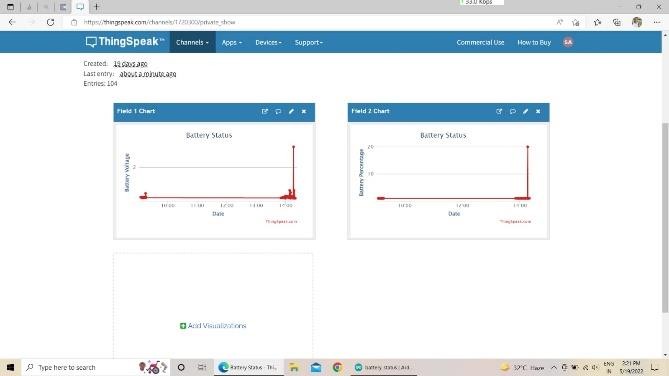


Fig6.1:-Observation after implementing**.**

# APPLICATION

* Foot step generated power can be used for agricultural, home applications, streetlighting.
* It can be also used in emergency power failure situations.
* Mobile charging.

#### ADVANTAGES

* Reliable, Economical and Eco-Friendly.
* Less consumption of Non-renewable energies.
* Extremely wide dynamic range, almost free of noise.

#### LIMITATION

* Only for particular palce.
* Initial cost of setup is high.
* Output effected by temperature variation.

# CONCLUSION AND FUTURE SCOPE

#### CONCLUSION

In concluding the words of our project, since the power generation using foot step get its energy requirments from the Non-renewable source of energy. There is no need of power from the mains and there is less pollution in this source of energy.

It is able to extend this project by using a me arrangement sand construct in the footsteps/ speed breaker so that increase the power production rate by fixing school and college, highways etc.

Thus in all we conclude that this technology can be prove to be an efficacious system of power generation using human locomotion.

#### Future Scope

In future aspects we can use this principle in the speed breakers at highways where are rushes of the vehicles too much thus it would increase input torque and ultimately output. This technique would be really very effective in populated places. So incoming year we can see its widely uses in school, cinema theaters, shopping complex, etc.

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