INTERNATIONAL JOURNAL
FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Footstep Power Generation by using Piezoelectric Material

Prabhat Ranjan Pandey[1], Anubhuti Singh[2], Neelansh Chaturvedi[3], Anmol Singh[4]

[1, 2, 3, 4]*Department of Electronics and Communication, IMS Engineering College, Ghaziabad, U.P.*

Abstract: Man is continuously using energy at a rapid rate and since the population is increasing day by day so it has become difficult to provide energy to each and every one as the energy generated by conventional resources is not sufficient. Because these sources are limited and depleting at a rapid rate. So, footstep power generation aims to provide non conventional way of producing energy.This method is quite relevant in highly populated countries like india and china where the roads,railway stations, bus stands,temples etc are all overcrowded and millions of people move around the clock.This footstep energy is usually wasted which can be conserved and put to a good use.Non conventional energy system is very essential at this point of time to our nation.

I. INTRODUCTION

Piezoelectric word is derieved from the greek word "PIEZEIN" which means to push,squeeze and press.The project is based on footstep power generation by using piezoelectric sensors. The project aims to convert mechanical energy generated by footsteps (walking and running) into electrical energy. Piezoelectric sensors used in this project belong to large family of materials called ferroelectrics. When mechanical stress is applied to piezoelectric sensors ,a voltage is generated. This phenomenon that produces electrical energy when a force is applied on piezoelectric material is known as piezoelectric effect. The AC output of the sensor is converted into DC. By using this energy conversion theorem and piezo theorem sensor we are proposing a new method for power generation

Block Diagram
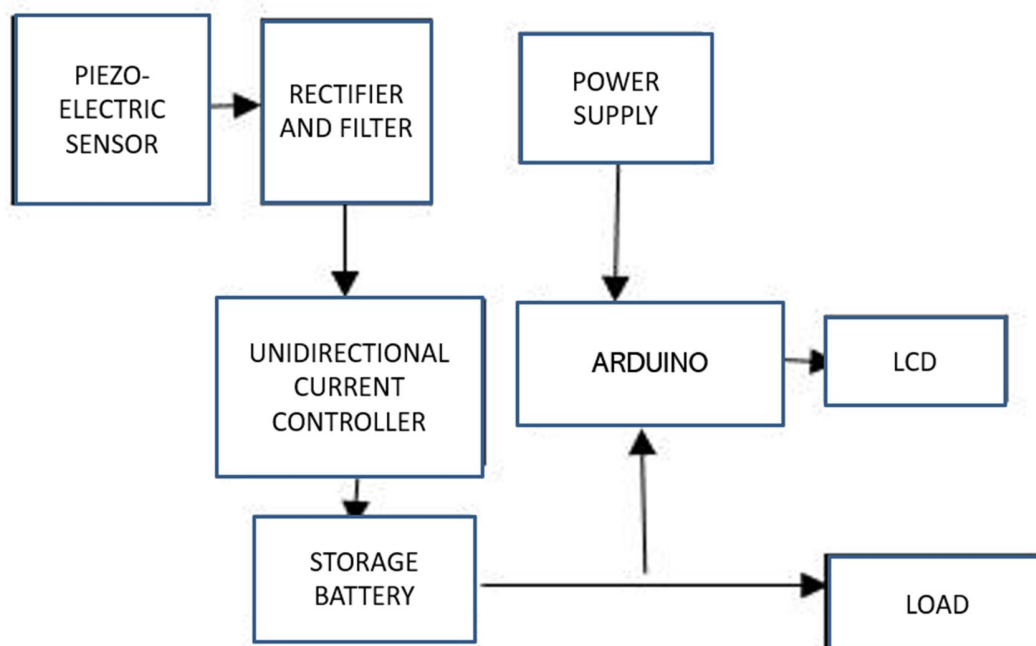
II.   COMPONENTS

A.   Arduino UNO

Arduino is single board microcontroller specially designed for students to develop various projects. It comes in different types like arduino UNO. Lily Pad Arduino, red board. Arduino mega. Arduino is open source hardware and Software Company. That provide design and specification so that different vendors can manufacture Arduino board. In this project, Arduino Uno has following specification Microcontroller - Atmega328p (8 bit AVR family microcontroller) Operating voltage- 5V

Input Voltage -7V to 12V

Analog pins-6

Digital I/O pin-14

Flash memory 32 kB (0.5 kB for bootloader)

SRAM - 2KB

Frequency (clock & speed) -16MHz

Figure 1-Arduino UNO

B.   Piezoelectric Sensor

There are two types of piezoelectric sensors available in market PZT and PVDF.These sensors convert kinetic energy into electrical energy.The array of piezoelectric sensor are used for generating enough voltage.There are two type of piezoelectric materials Natural piezoelectric material and Synthetic piezoelectric material.

Natural piezoelectric Materials-Quartz, Rochelle salt, Topaz, Silk, DNA.

Synthetic piezoelectric material-PZT (Lead Zirconate Titanate),ZNO, BaTio3, Sodium Tungstate.

The piezoelectric sensor is a device which can convert pressure into voltage.The output of piezoelectric sensor is in AC form ,It is converted into DC by using Full Bridge Rectifier.

Figure 2-Piezoelectric Sensor

C.   LM358P IC

It is a dual operation amplifier. Here we use diodes as unidirectional current controllers. It will allow current flow in only one direction. It is used to protect back current to the array of sensors.

Full bridge rectifier is used to convert AC to DC.

Figure 3-LM358P IC

D. LCD Display

A 16*2 LCD (Liquid Crystal Display) is used to display the voltage generated by the sensors.It is interfaced with the Arduino UNO

Figure 4-LCD

E. Battery

The battery is used to store the electrical energy produced by the array of sensors and to run the Arduino UNO.It consists of electrochemical cells.

Figure 5-Battery

III. WORKING

The piezoelectric sensors are connected in series to generate sufficient voltage. After making connections when we provide mechanical stress to the piezoelectric sensor it generates voltage. The output of piezoelectric sensor is in AC form it is converted into DC by using full bridge rectifier. Diode is used for blocking the current flow back to the piezoelectric sensor. The generated degraded voltage will be fed to different blocks of a circuit element to get a proper output. Resultant output is stored in the battery. A 16*2 LCD display is interfaced with the Arduino UNO to display the generated voltage and status of battery.

A. Applications

1) Mobile charging
2) Street lighting
3) Emergency power failure stations
4) Electronic Frequency generation
5) Cigarette Lighters
6) Power supply at bus stands and railway stations.
7) Shopping complexes, cinema halls

B. Advantages
1) Just simply walking generates power
2) No need of fuel input
3) Non-conventional system.
4) Low cost of setup.

IV. CONCLUSION

The project footstep power generation is successfully tested and implemented which is the best economical, affordable , non - conventional energy solution to common people. The wastage of energy can be converted to usable form using the help of piezoelectric sensor. The project can be implemented in rural areas where there is either no source of generating electrical energy or the electrical energy produced by conventional ways is not sufficient. By using this energy conversion theorem and piezo theorem we are proposing a new method of power generation.

REFERENCES

[1] R.J.M. Vullers, R.V. Schaijk, I. Doms, C.V. Hoof, and R. Mertens "Micropower energy harvesting" Solid state electron, vol. 53,no 7,pp .684-693, 2009

[2] P.D. Mitcheson, E.M Yeatman, G.K. Rao, A.S Holmes and T.C. Green "Human and machine motion for wireless electronic devices" Proc. IEEE vol. 96, no. 9, pp.1457-1486,sep.2008

[3] M. Ferrari V. Ferrari, D. Marioli and A. Taroni "Modeling, fabrication and performance measurements of a piezo electric energy convertor for power harvesting in autonomous microsystem", IEEE Trans. Instrum Meas vol.55,no.6'pp.2096- 2101,Dec 2006.

INTERNATIONAL JOURNAL
FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 ⓒ (24*7 Support on Whatsapp)