FOOTSTEP POWER GENERATION USING PIEZO ELECTRIC SENSOR

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Abstract: Day after day electricity demand is increasing and it is unable to overcome the global issue by using the traditional power generating sources. The mechanical energy generated by the foot step is converted into electrical energy. The main aim of this project is to develop the power generation method which in turns helps to reduce power shortages. In this project the conversion of mechanical energy into electrical energy by using piezoelectric sensors. This project is kind of proposal for the employment and application of extra energy in foot step of humans is very much to the purpose of extremely populated nations like India and China. In our project we have used the technique of power generation through foot step as a source of energy that can be obtained while walking on the certain arrangements like stairs, footpaths, platforms, runways and these systems can be installed elsewhere. Specially in the dense populated areas.
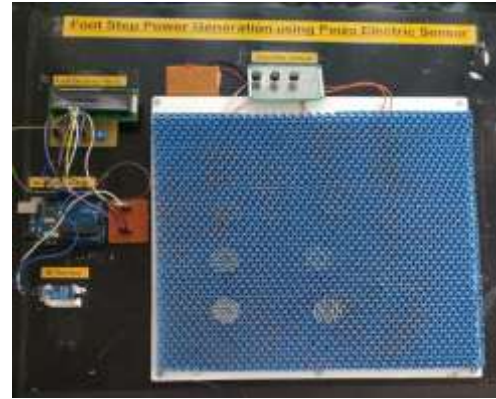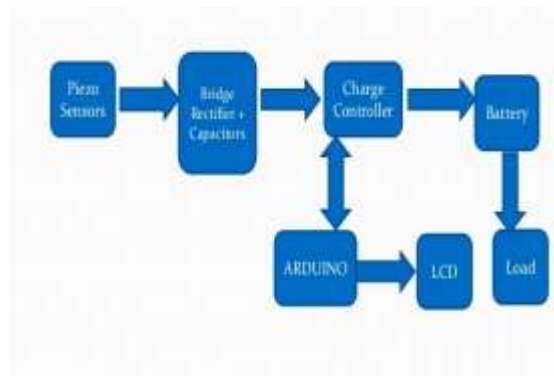
Keywords: ARDUINO UNO, Piezoelectric sensor, IR sensor, Bridge rectifier

1. INTRODUCTION

Increasing demand towards the electricity day by day and its used has become so advanced and applicable in the present life of humans. New innovations of technology each day demands more power of electricity as the population of humans in increasing day by day linearly the energy demand is increasing. Foot step power generation technology is based on the piezoelectric principle. Piezoelectric material has the ability to build up the Electrical charge from having pressure and strain applied to them. A sensor is a basically a device that measures a physical quantity and converts it into a signal which can be a read by an instrument or observer. A sensor named piezoelectric sensor has been used in this project. A piezoelectric sensor is a device that uses the piezoelectric the piezoelectric effect to measure pressure, acceleration, strain or force by converting them to an electrical signal. This sensor has been proven to be versatile tools for the measurements of various processes. In 1950, piezo electric sensor started to be used for industrial sensing applications. There are many reasons such as quality assurance, process control and research and the development in many different industries. Applications such as in medical, aerospace, nuclear instrumentation and as a pressure sensor in the touch pads of mobile phones.

FIGURE 1. Footstep Power generation by using piezoelectric sensor.

2. BLOCK DIAGRAM

2.1 WORKING OF SYSTEM

The project made by us is named as the footstep power generation using piezoelectric sensor. This project consists of components such as piezoelectric sensor, ARDINO UNO, LCD, battery, LED, bridge rectifier, rubber mat and connecting wires. This project generates electricity for emergency cases. The stepping of the human at any place where we have the foot step power generation, while the step the energy or the force is being provided. It consists of piezoelectric sensors under the rubber mat. When the step is provided the piezo converts the mechanical charge into electrical charge this is the basic principle of piezoelectric sensor. Where it first stores the mechanical energy and converts the energy into electrical energy. Then the electrical charge created is then provided to bride rectifier. Bridge rectifier is usually used for the conversion of AC current to DC current. As we needed to get the output present in the form of blinking of the led, for glow of LED the

current required is DC current so there we have used bridge rectifier. After the conversion of AC current to DC current with the use of bridge rectifier the output is being sensed with the use of IR sensor. IR sensor in our project is used for the counting the number of steps of a people. After the counting of the steps, the calculated step of the people using ARDUINO UNO programmed the steps and converts it into program and the steps that are being calculated are interfaced and make sure that it generates the defined amount of electricity. After the calculation of the electricity generated it is being shown on the LCD display. This is how project works are.

3. DESCPRITION OF COMPONENTS

3.1 PIEZOELECTRIC SENSOR

The piezo electric sensor is a device that uses the piezo electric effect to measure changes in pressure, acceleration, temperature strain or force by converting them to an electrical charge. The prefix piezo is Greek word for press or squeeze.   Piezoelectric material is mainly categorized in two type's namely piezoelectric ceramics and single crystal materials. Piezoelectric are also known as PZT ceramic (Lead Zerconate Titanate). The piezo element that is being used is disc shaped piezo element. The reason behind this disc shaped piezo element is as it tends bent very easily. It creates AC current through the use of foot stepping. The energy created by this sensor gives the generated current to the bridge rectifier.

FIGURE 2. Piezoelectric sensor

3.2. BRIDGE RECTIFIER:

Bridge rectifier is basically a converter which converts AC current to DC current. It means that it reactifies AC input to DC output. This is widely used in power supplies that provide necessary DC voltage for the electronic components and devices. It consists of four diodes or more. Depending on the load current requirements, a proper bridge rectifier is selected. Components rating and specifications, breakdown voltage, temperature ranges, transient current rating, forward current rating, mounting current requirements and other consideration taken into account while selecting rectifier power supply for an appropriate electronic circuit application.

As the output of the piezoelectric sensor is an alternating current (AC) we have used bridge rectifier to convert the alternating current into direct current. The purpose for the conversion of the current is to make the LED glow.

FIGURE3. Bridge Rectifier

3.3. IR SENSOR

IR sensor is also known as infrared sensor. It basically senses the surrounding and detects the motion of the object or anything else. Infrared sensor is widely used in electronic field. These sensors are used for the humans infeasible sensing. Active and passive are the two types of infrared sensor. Emitting and detecting infrared radiation is carried in active sensor while in passive sensor only emitting is done.Infrared sensor basically works on three principles or laws namely Planck's radiation, Stephan Boltzmann law, and Wien's displacement law. The radiation that is given out by the piezoelectric sensor are detected by the infrared sensors.


FIGURE 4. IR Sensor

3.4. ARDUINO UNO

ARDUINO Uno has digital and analog input and output pins. Out of which 14 are digital input /output pins and 6 are analog input /output pins. Following are the some of technical specifications of ARDUINO such as it is a microcontroller board on microchip AT mega328P, it's operating voltage is 5 volts, input voltage provided to the ARDUINO is between 7 to 20 volts, the DC current per input /output pins is 20 Ma, ARDUINO has the clock speed of 16MHz. The special pins operating on ARDUINO are serial/UART, external interrupts, PWM, SPI, TWI and AREF.IDE (Integrated Development Environment)is a software that is used for the ARDUINO. In real world by using ARDUINO we can control and sense the external

electronic devices. We have used ARDUINO UNO to run the program without hardware programmer to load the device. It has two memories namely program memory and data memory where in program memory the code is stored and in data memory data is stored.
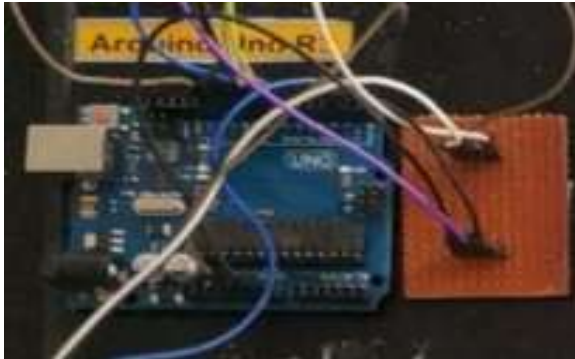
FIGURE 5. ARDUINO UNO

3.5. LCD

LCD is a liquid crystal display. The LCD that is being used in our project is 16x2 LCD. It operates between 4.7V to 5.3V. The LCD display module which shows numbers and alphabets is an alphanumeric LCD.1Ma is the current consumption of the LCD module without any backlight. 16 characters are printed in each row, like this it has 2 rows. 16x2 LCD module can be operated on 4 bit and 8 bit mode. 5x8 dots are required for per character to build. The device display is color TFT.5in is the screen size. It has many connecting terminals such as audio video, external power supply, input jack, earphone jack, review connector. The dimensions of LCD are width (163mm),height (125mm), 30.5mm.

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5. CONCLUSION

In this project, by using piezoelectric sensors we have developed footstep power generation and it is successfully tested and implemented which is the best economical and affordable energy source to everyone in our society. Developing a project like this in huge populated countries like India and China where energy source is a very big problem in our day to day life. Due to these problems we have made this project to overcome the problem in emergency cases.

6. REFERENCES

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3. Piezoelectric foot step power generation by sagar institute of technology.

BIOGRAPHIES

 Mrs. Sheetal Pawar received BE in Electronics and Telecommunication engineering from Shivaji university. And ME in Microwave from Pune university. Presently working as a Professor in MIT polytechnic. Having working experience of 7 years.

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