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Generation of Electric Power based on Footsteps

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Abstract

The impact of electronic devices consuming low power increased in a progressive manner in the recent years. These devices are employed to meet the requirements of our daily life comfort. These devices portable in nature consume more power which raises a need for obtaining renewable energy thereby creating an interest among the users. In this paper, a piezoelectric generator is implemented to generate power from pressure exerted on certain materials, This work illustrates the use of piezoelectric materials to obtain power from the pressure obtained from the walking process of human beings and then to accumulate the energy. This work also represents a piezoelectric energy harvesting model having merits of low cost and easy implementation.

Keywords: Arduino, Piezoelectric crystal, Sensors

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1. Introduction

Nowadays energy is one among the most important issues in the world. Renewable energy sources can be a good alternative to combat the crisis of energy problem. Many researchers are working to introduce substitute energy sources from various levels of nature which can be echo friendly for the atmosphere. Energy harvesting is to obtain small percentage of energy from various sources pertaining to the surroundings. The method of obtaining energy is being implemented in the form of wind, solar and thermal energy. If this e energy harvesting methodologies produce small level of power, it is called macro energy technique. If this is produced still smallest level of power, then it is called micro energy method which is dependent on vibrations, thermal energy, sun light etc. The objective of the work is based on obtaining the micro energy. .

2. Scope and Objectives of the Work

The objectives of the work are as follows -

- To produce renewable electric power from footstep using piezoelectric disk placed along the pathway.
- To reduce the cost for power generation thereby increasing the efficiency.

Generally piezoelectric sensors shall be arranged in two forms - series and parallel in order to ascertain that there would be sufficient production of electricity. The output will be measured using a multi-meter and a row of '5' light emitting diode would be placed to indicate the presence of electricity. This energy can be used as a secondary source of power to battery. In addition, the total cost of electricity application can be reduced and the maintenance of piezoelectricity is minimal. The life span of a piezoelectric disk is also long.

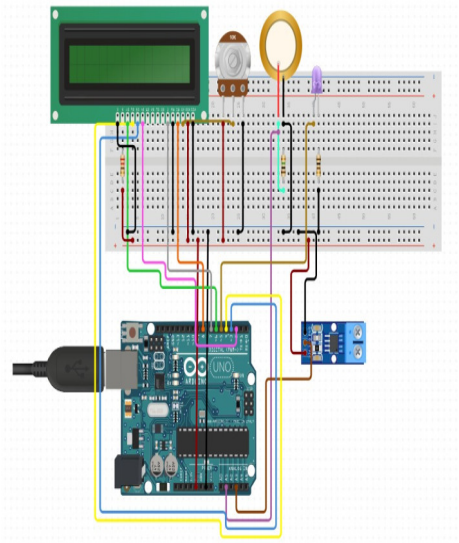

Fig 1: Schematic Diagram of the Work

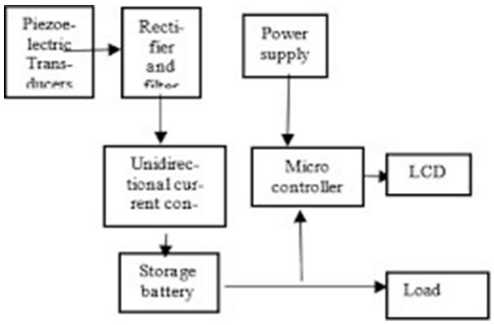

Fig 2: Block Diagram of the Work

3. Proposed System

The piezoelectric effect is an essential process which persists in various types of crystal materials. General illustrations of these crystal materials are Quartz, Rochelle salt etc. There are two categories of piezoelectric effect - direct effect and inverse effect. The electric potential can be obtained during the application of mechanical vibrations with respect to direct effect and deformation of materials obtained with respect to indirect effect. Here direct effect is implemented. Figure 1 shows the methodology.

Figure 4 shows the schematic of a piezoelectric material which can be used for energy generation. The output voltage obtained is in low level volts range. Hence the crystal materials can be arranged in a series manner in order to obtain high level of voltages. Then this power can be stored in a series of capacitors banks.

Fig 3: Arduino Board

4. Arduino Board

Arduino boards employ various categories of processors or micro controllers. They comprise a number of input and output pins, either digital or analog in nature connected to various expansion boards or circuits. The serial communications interfaces associated with USB are employed for dumping the programs from the computers. The processors or controllers can be programmed either using C or C++. Moreover, these boards comprise an integrated development environment (IDE) with respect to the processing language.

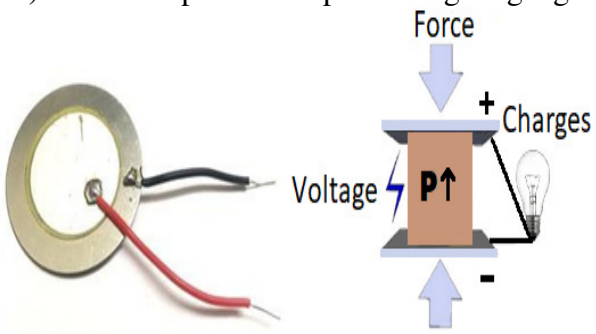

Fig 4: Piezoelectric Sensor

5. Piezo-Electric Sensors

In various companies, they are employed for ascertaining the quality in control methods and development of products. Pierre Curie discovered the piezoelectric effect in 1880, but manufacturers begin to use piezoelectric effect for industrial applications in 1950 onwards. They find application in different fields such as as medical, aviation, automation etc. Piezoelectric elements are used to monitor combustion during development of internal combustion engines in the automobile industry. Generally these sensors are directly fixed into the respective holes in the spark plug associated with a piezoelectric sensor.

Fig 5: Current Sensors

Current Sensors

ACS712 provides accurate solutions for AC or DC current sensing in industrial and communications systems. Its package provides for easy implementation by the customer. Typical applications include motor control, switched-mode power supplies and current fault protection. A Hall sensor circuit is present inside the device with a copper conduction path near the surface of the die. A magnetic field generated by this current passing through this path will be detected by the Hall IC and this is transformed into a proportional voltage.

Arduino IDE

The Arduino IDE is a software application meant for various operating systems and developed using Java. It includes a code editor for implementing a lot of operations pertaining to text, indenting and matching. It gives a facility to compile and dump the code to the controller board. It also provides a software library comprising various input and output methods. It also provides a provision for transforming the machine code into a hexadecimal text file and dumping into the controller board using loader software.

5. Conclusion

This work is implemented in a successful manner and gives the optimum energy solution to all human beings. This can be implemented for various types of applications in the urban areas where large requirement of power exists. In addition, the D.C loads can be driven as per the pressure applied on the piezo electric sensor. Since it is more economical, it is an optimum product which can enhance the operating span of time of essential electronic products.

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