International Journal of Research in Engineering, Science and Management
Volume-3, Issue-4, April-2020
www.ijresm.com | ISSN (Online): 2581-5792

Energy Generation Through Footsteps Using Piezoelectric Sensor

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***Abstract*: The production of electric power from the footstep movement of the peoples and the pressure exerted during walking is the main objective of this project. The mechanical power transformation into electrical power as the pressure exerted by the footstep and by using transducers is basically called as "Foot Step Power Generation System". One of the most interesting methods of obtaining the energy surrounding a system is to use piezoelectric materials. There exists variety of energy harvesting techniques using piezoelectric components. This type of generation is pollution free. In this project we are designing a model using piezo electric sensors, which changes mechanical energy developed by the individuals on the floor to electrical energy. This conversion is done from mechanical force that is human weight. The force exerted on the piezo electric sensors measured in Newtons.**

***Keywords*: Piezoelectric sensor, Energy generation.**

1. Introduction

Human-powered transport has been in existence since the time immemorial in the form of walking, running etc. However modern technology has led to the development of machines to enhance the use of human power in more efficient manner. This project includes no of simple setup and component that is installed under the walking or standing platform. When person applies dynamic pressure on this platform their body weight compresses the setup of system and current produced is stored in battery. More movement of people will generate more energy. It can also be noted that the setup harness human locomotion power by making use of the mechanism that would bderive energy from pounding feet in crowded places. This method generates the electricity without polluting environment. The source or energy is continuous and renewable.

2. Related work

First, in paper "The N. C. Park, B. H. Ko, Y. P. Park, and Y. Ahn," Vibration and acoustic noise arise from the Multilayer Ceramic Capacitor (MLCC) because of the piezoelectric effect of dielectric substance which consists of BaTiO3BaTiO3. However, the phenomenon is not analyzed clearly because the MLCC shows different behavior compare with ordinary piezoelectric substance like PZT". Thus, MLCC was tested under the several DC bias conditions and heat treatment effect was also tested and analyzed in this paper. From the test, MLCC shows not only piezoelectric effect but also another physical phenomenon like electrostriction. Also, it was verified that DC bias affect to the piezoelectric constant of MLCC [1].

In this paper, by Anil kumar Due to the rapid depletion of the main fossil source of energy (oil), it is vital to search for other sources of energy. Also, the global pollution due to traditional sources of energy moves scientists to search for other sources of green energy. One sustainable and green source of energy is the power generation from the human footsteps". This research work aims to design and test a simple device that converts the kinetic energy of the human footsteps to electrical energy. This device may be used in all crowded spots with a big number of pedestrians such as mosques, churches, underground stations, theaters, stadiums, etc. This technique of energy harvesting is suitable for such applications as street lighting, advertising billboards, and information displays. The device was efficiently designed, fabricated and tested [2].

In this paper "S. D. Mendhule and V. K. kankal states that the slab of concrete harnesses kinetic energy whenever it is stopped on.

This energy created by 5 mm of flex in the material is then either stored by lithium polymer batteries contained within slabs or transmitted immediately to streetlights or other electronics located close by. The current model made from stainless steel, recycled car tires and recycled aluminum, also includes a lamp embedded in the pavement that lights up every time a step is converted into energy [3].

In this paper "The goal of Almouahed paper is to quantify the electrical energy that can be harvested within a new generation of instrumented knee implant during normal walking. This generation of knee implant is proposed to assess the in vivo anteroposterior and mediolateral distributions of tibiofemoral force on the tibial baseplate without the need to be powered from an external source of energy [4].

3. Methodology

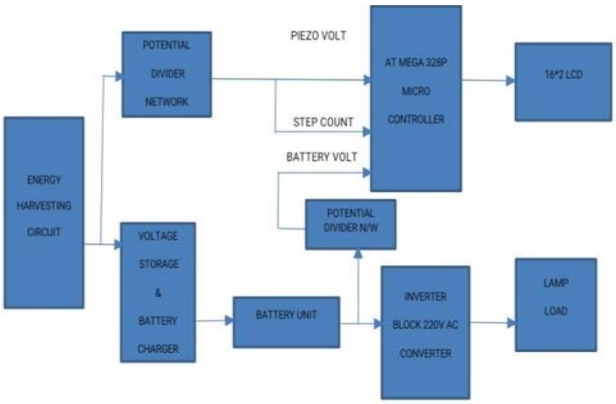

Fig. 1. System architecture

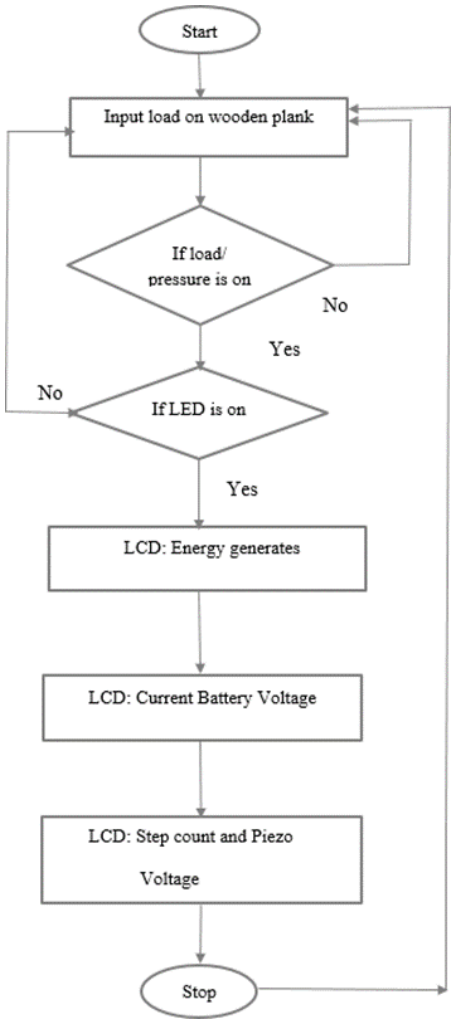

Fig. 2. Data flow diagram for proposed system

4. Working

The energy harvesting circuit block consists of 18 piezo transducers placed on a wooden Planck. When a dynamic pressure is applied on them, voltage across the piezo transducer is generated. The output of piezoelectric sensor is not stable so we use bridge rectifier to convert the variable voltage into a linear voltage. Approximately 8-12V from this piezo transducer bank is produced.

One end of the bridge rectifier is given to capacitor of 2200uF followed by SPDT Switch. The voltage generated by the piezoelectric transducer bank gets stored in capacitor and when the switch is slided all the stored energy is transferred to battery. The battery used here is a lead acid battery, 12V.

Voltage divider configuration which lowers the voltage to the level of microcontroller as we can't fed 12V directly to the capacitor so it is used to divide the voltage. Diode blocks the current flowing from capacitor to piezoelectric sensor.

In indicator section includes LED to indicate the power generation. Inverter converts 12V DC to 230V AC, by this AC voltage AC loads can be operated. After reading the battery voltage and the voltage generated from the piezo electric transducer is displayed on 16*2 LCD.

The LCD is interfaced with the microcontroller ATMEGA328P for programming purpose.

This microcontroller is of 8-bit, 32kb flash with 1K RAM and has 16mHZ speed. The crystal oscillator is connected to microcontroller which is used to give clock signal. This unit consists of an IC called 7805 which converts12V to 5V. Switch controls the AC load which finally serves our goal of providing electricity to rural clinics/hospitals.

5. Conclusion

The project "Foot step power generation" which gives 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 using this project, we can drive both AC and DC loads according to the force we applied to the Piezoelectric sensor. The smart materials discussed in this project are responsive to many natural resources for green energy generation. The increase in the use of alternative resources for renewable energy can substantially decrease carbon footprint and consequently the effects of global warming. So, we are implementing this system to generate energy by using piezo electric sensors, the design of proposed system is to provide electricity to run clinics/hospitals.

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