

Footstep Power Generation Using Piezo Electric Transducers

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Abstract: An advanced footstep power generation system proposed here uses the piezo electric sensors to generate power through footsteps as a source of renewable energy that we can obtain while walking on a certain arrangement like stepping foot on a piezo tiles. This project describes the use of piezoelectric materials in order to harvest energy from people walking vibration for generating and accumulating the energy. The basic working principle of “footstep power generation system” is based on piezo electric sensors. When the flooring is engineered with piezo electric technology, the electrical energy produced by the pressure is captured by floor sensors and converted to an electrical charge by piezo-electric transducer. These sensors are placed in such a way that it generates maximum output voltage. This output is provided to our monitoring circuitry which is microcontroller based circuit that allows user to monitor the voltage and charges a battery, and this power source has many applications. Our project model is cost effective and easy to implement.

Keywords--piezoelectricity, footsteps, power-generation, energy conservation, force or pressure.

I. INTRODUCTION

At display, power has turned into a help for human populace. Its request is expanding step by step. Present day innovation needs an immense measure of electrical power for its different activities. Power generation is the single biggest wellspring of contamination in the entire world. At one hand, rising worry about the hole amongst request and supply of power for masses has featured the investigation of interchange wellsprings of vitality and its economical utilize. Then again, human population is increasing everywhere throughout the world and thus vitality request is expanding step by step directly. In like manner, it is a target of the present development to give a technique for electrical power generation from this regularly expanding human populace that does not adversely affect the earth. This innovation depends on a rule called the piezoelectric impact, in which certain materials can develop an electrical charge from having weight and strain applied on them. Piezoelectricity alludes to the capacity of a few materials to produce an electric potential in light of connected weight. Inserted piezoelectric material can give the enchantment of changing over weight applied by the moving individuals into electric current. Human-fuelled transport has been in presence since time immemorial through

strolling, running and swimming. However current innovation has prompted machines to upgrade the utilization of human-control in more effective way. In this specific circumstance, pedal power is an astounding wellspring of vitality and has been being used since nineteenth century making utilization of the most capable muscles in the body. Ninety-five Percent of the effort put into pedal power is changed over into vitality. Pedal power can be connected to an extensive variety of employments and is a straightforward, shoddy, and helpful wellspring of vitality. Be that as it may, human dynamic vitality can be valuable in various ways however it can likewise be utilized to create power in view of various methodologies and numerous associations are as of now actualizing human controlled advances to produce power to control electronic devices.

II. LITERATURE SURVEY

Man has need vitality and is utilizing it at an expanding rate for sustenance and flourishing since time immemorial. Because of these great deals of vitality assets have been depleted and squandered. The proposition to utilize stream vitality for foot quality with human development is exceptionally applicable and vital for high-thickness nations, for example, India where railroad station, sanctuaries and others are swarmed day and night. At the point when the deck is designed with piezoelectric innovation, the electrical vitality created by the weight is caught by ground sensors and changed over into an electrical charge by piezo transformers, at that point put away and utilized as a vitality source. This power source has numerous applications as in farming, home application and road remote lighting as a vitality hotspot for sensors in locations.

Monitoring framework which is likewise blame tolerant to ensure that there is a continuous correspondence between the patient and the healing facility even in the instances of energy cut or framework mistake. The interest for control is expanding step by step. Because of increment in populace there is part of energy cut-off. We utilize control generators which expect fuel to create power which has hurtful impact on nature. So there is a need to gather control utilizing an elective wellspring of vitality and furthermore doesn't have any negative impact on the earth. A definitive

point of this task is to grow much cleaner financially savvy method for control age strategy, which thusly cuts down the Earth-wide temperature boost and also lessen the power deficiencies.

III. COMPONENTS USED

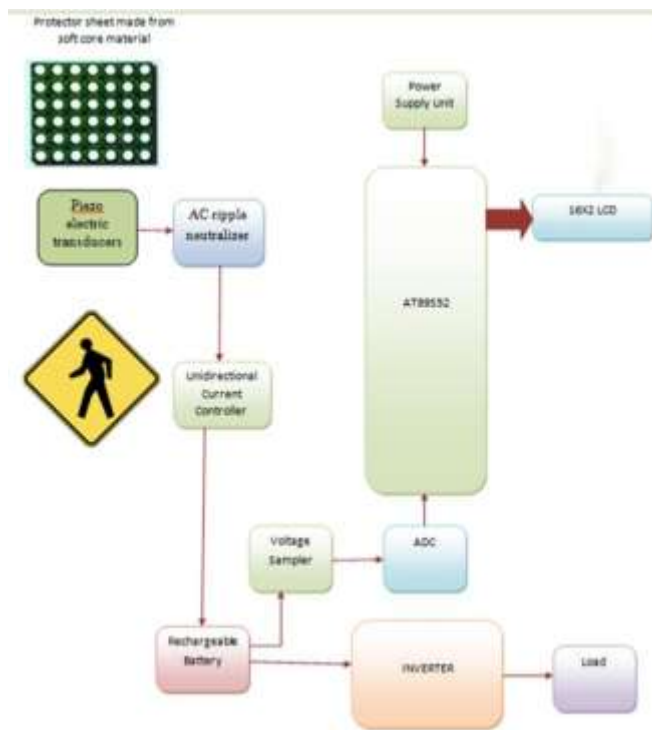


Figure 1: Block Diagram

A. Piezoelectric Sensor: A piezoelectric sensor is a device that uses the piezoelectric impact to gauge weight, quickening, strain or power by changing over them to an electrical flag. Piezoelectric impact is the capacity of specific materials to produce an electric charge in light of connected mechanical pressure. At the point when piezoelectric material is set under mechanical pressure, a moving of the positive and negative charge focuses in the material happens, which at that point brings about an outer electrical field. Some normally piezoelectric happening materials incorporate Berlinitite (basically indistinguishable to quartz), genuine sweetener, quartz, Rochelle salt, topaz, tourmaline etc. A case of man-made piezoelectric materials incorporates barium titanate and lead zirconate titanate.

B. Rectifier: The yield from the stride body is sustained to the rectifier. It changes over A.C. into pulsating D.C. The rectifier might be a half wave or a full wave rectifier. In this undertaking, an extension rectifier is utilized in light of its benefits like great strength and full wave correction. The Bridge rectifier is a circuit, which changes ac voltage to dc voltage utilizing both half cycles of the information air conditioning voltage.

C. Unidirectional Current Controller: In this venture we utilize diode as unidirectional current controlling device. As we are as of now comfortable with the most well-known capacity of a diode is to enable an electric current to go one way (called the diode's forward direction). While blocking current the other way (the turnaround heading). In this way, the diode can be thought of as an electronic rendition of a check valve. The diode utilized as a part of this venture is D=1N4007.

D. Microcontroller AT89S52: Here we are utilizing AT89S52 microcontroller to show the measure of voltage created at whatever point we put our foot on stride body and furthermore voltage exhibit in the battery. The AT89S52 is a low-control, superior CMOS 8-bit microcontroller with 8K bytes of in-framework programmable Flash memory. The device is utilizing Atmel's high-thickness non-unstable memory innovation and is perfect with the business standard 80C51 guideline set and stick out.

E. Analog to Digital Converter (ADC): An ADC is an electronic device that changes over an info simple voltage or current to a computerized number relative to the size of the voltage or current. In this task we are utilizing an ADC0804 which is a normally utilized 8-bit simple to advanced convertor. It is a solitary channel IC.

F. Liquid Crystal Display (LCD): A 16x2 LCD is utilized on the equipment to show the estimations of pulse and body temperature at the same time when they are estimated. The LCD is associated through the microcontroller; this paper requires just a single line of the LCD for showing the outcomes. The outcomes are in ASCII characters.

G. Light Dependent Resistor (LDR): Photograph resistors, otherwise called light dependent resistors (LDR), are light touchy gadgets regularly used to show the nearness or nonattendance of light, or to quantify the light force. Oblivious, their protection is high, here and there up to $1M\Omega$, yet when the LDR sensor is presented to light, the protection drops drastically, even down to a couple of ohms, contingent upon the light power. LDRs have an affectability that differs with the wavelength of the light connected and are nonlinear gadgets.

IV. IMPLEMENTATION

The system allows for a platform for placing footsteps. The piezo sensors are mounted below the platform to generate voltage from footsteps. The sensors are placed in such an arrangement so as to generate maximum output voltage. This is then provided to our monitoring circuitry. The monitoring circuit is a microcontroller based that allows the user to monitor the voltage generated and this voltage is given to a rechargeable battery. It also displays the charge generated on an LCD display.

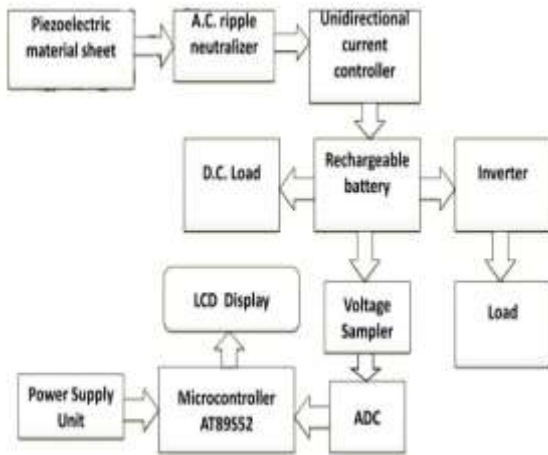


Figure 2: Implementation of block diagram

V. WORKING PRINCIPLE

The basic working principle of our project is based on the piezoelectric effect. Non-conventional energy using foot step is converting mechanical energy into the electrical energy. Foot step board consists of 15 piezo electric sensors which are connected in parallel. When the pressure is applied on the sensors, the 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.

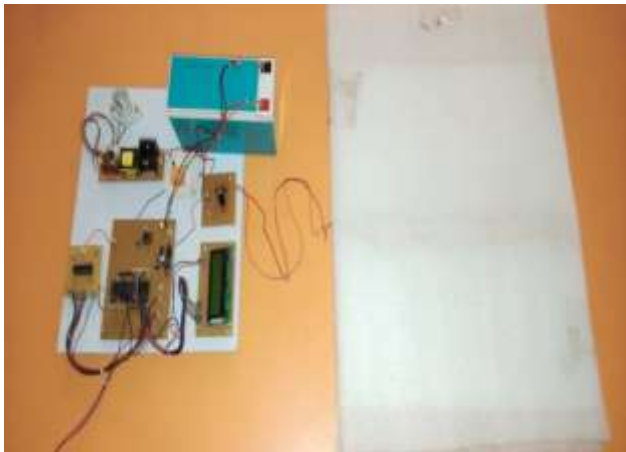


Figure 3: Working Model of our Project

The above figure 3 shows the working model of our project where the 15 piezo discs are connected in parallel on a tile which is covered with a foam sheet and other components are arranged as shown in above figure.



Figure 4: Working

As we can see in above picture, when pressure is applied on the piezo tile electricity is generated and this is stored in the battery. Here we are using a LDR instead of a switch, as we cover the LDR the power stored in the battery is used to glow the bulb (ac load).

VI. APPLICATIONS

- Can be broadly utilized as a part of colleges, schools and universities.
- This can be actualized in air terminals, transport stations, railroad stations.
- Street lights can be actualized utilizing this strategy.
- This framework can be actualized in swarmed places like shopping centres, pathways and so forth.

VII. ADVANTAGES

- Power generation is basically strolling on step.
- No need of fuel input.
- This is a non-ordinary technique for producing power.
- No moving parts - long administration life.
- Self-producing - no outside power required.
- System is reduced yet exceedingly touchy.
- It is Reliable, Economical, and Eco-Friendly.
- Less utilization of Non-sustainable power sources.
- Power is likewise produced by running or practicing on the progression.
- Extremely wide powerful range, free of commotion.

VII. DISADVANTAGES

- Initial cost of this arrangement is high.
- Care ought to be taken for batteries.
- It isn't reasonable for estimation in static condition.

IX. CONCLUSION

The project undertaken is effectively tried and actualized which is the best conservative, reasonable vitality answer for

average citizens. This can be utilized for some applications in rustic zones where control accessibility is less or thoroughly truant. As India is a creating nation where vitality administration is a major test for gigantic populace. By utilizing this task we can drive both A.C. and in addition D.C loads as indicated by the power we connected on the piezo electric sensor. This technique gives an effective power generation in very populated nations as it diminishes control request without contamination. As a reality just 11% of sustainable power source adds to our essential vitality. On the off chance that this undertaking is sent at that point not just we can conquer the vitality emergency issue yet in addition make a solid worldwide ecological change.

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