IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 2, July 2022
Impact Factor: 6.252

Advanced Footstep Power Generation System

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Abstract: *Because the human species consumes a large amount of energy at a rapid rate for survival and well-being, power resources have been depleted and enervated. One of the most pressing challenges, as a result of the expanding population, is the generation and use of electricity. Despite the fact that there are numerous power supplies available today, both non-renewable and renewable, we are still unable to meet our electricity requirements. So, in order to overcome these concerns, we'd like to introduce our "Advanced footstep power generating system." Pressure or mechanical energy expended while walking or running is usually squandered. As a result, the project's major goal is to create energy through walking or running. The electricity generated will be used in the home.*

Keywords: Energy Crisis, Supply and demand, Renewable Energy, Piezoelectric etc

I. INTRODUCTION

Many energy resources have been depleted and wasted as a result of rising population. There is a constant demand for energy and power, and there are a variety of ways to generate it; among these options, footstep power generation can be effective.

Proposal for utilizing waste energy from human movement is particularly relevant and vital in densely populated countries where roadways, railway stations, bus stops, and other public spaces are constantly congested and millions of people move around the clock.

Walking is the most widespread kind of human activity. When a person walks, he loses energy to the road surface in the form of impact, vibration, sound, and so on, as a result of his weight being transferred to the road surface through foot falls on the ground. This energy can be harnessed and turned into a form that can be used.

The goal is to create a footstep power generating system that can convert and produce power from foot impact energy. Although it will not be enough to meet the world's excessive demand for energy, the usage of a footstep power generation system will be able to transform and reduce dependency on traditional power generation methods. It will be an excellent choice because it is both cost-effective and simple to deploy.

II. LITERATURE SURVEY

Paper 1: Advanced Foot Step Power Generation System
Mr. Prasad Anipireddy, Mr.T.V.Subba Rao, Madhusudana Rao

We are generating power in this project by walking or jogging. Walking up and down the stairs generates energy. The energy created will be stored, and we will be able to use it for home purposes. This system can be put in places where people travel around the clock, such as houses, schools, and colleges. When individuals walk on the steps or on a platform, the weight of the person generates power. The piezoelectric sensor in the control mechanism converts mechanical energy delivered to the crystal into electrical energy. When there are vibrations, the foot exerts a tension or straining force on the flatplatform. It can be used to charge gadgets such as laptops, phones, and other electronic devices. The piezoelectric effect is caused by mechanical vibrations.

Paper 2 : Development of a footstep power generator in converting kinetic energy to electricity
Chun Kit Ang, Ammar A. Al-Talib, Sook Meng Tai, and Wei Hong Lim.

Kinetic energy is one of the renewable energy sources. A significant amount of research was done to see if it was possible to transform kinetic energy into electricity. Nonetheless, the majority of past studies focused on the selection of appropriate materials and the sophisticated design of power generators. By installing a mechanical footstep power

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generator on the hind foot region, this research proposes a simple and low-cost mechanism to improve the performance and efficiency of energy conversion from kinetic energy to electricity energy. The mechanical footstep power generator in this study is based on the rack and pinion principle, with the goal of reducing the mechanical structure's complexity.

Paper 3: Study on Footstep Power Generation using Piezoelectric Tile
Anis Maisarah Mohd Asry, Farahiyah Mustafa, Sy Yi Sim, Maizul Ishak, Aznizam Mohamad
The vibration generated between the surface and the footstep is wasted during walking. Electrical energy can be generated and the need met by repurposing this wasted energy. A piezoelectric transducer is the type of transducer used to detect vibrations. The mechanical energy is converted into electrical energy by this transducer. When pressure is delivered to the piezoelectric transducer by a footstep, the pressure is converted.or the conversion of force into electrical energy. A series-parallel connection is used to connect the piezoelectric transducer. It is then placed on a wooden tile as a model for a footstep tile to apply pressure to the piezoelectric transducers. This tile can be used in a congested area, on a walking path, or on workout equipment. Low-power appliances can be powered by the electric energy generated by this piezoelectric tile. The kinetic energy from the footstep was harvested using a lead zirconate titante (PZT) piezoelectric transducer in this work.

Paper 4 : Advanced Footstep Power Generation System using RFID for Charging
Krati Gupta, Bhupendra Singh, Madhuram Dixit, Renu Rani
The goal of this project is to use strides as a source of environmentally friendly energy that we may obtain by walking on a plan similar to venturing foot on piezoelectric tiles. The piezoelectric sensors are used in a high-level stride power age framework provided here. The piezo sensors are arranged beneath the stage in a series mix to generate a voltage from stride. After that, the circuit is forwarded to our testing hardware. The circuit is an arduino-based checking circuit that allows users to monitor the charges and voltage of a connected battery, and this force source has a variety of uses. It also measures the voltage generated by our stride and displays it on an LCD. It's also not a USB cell phone charging port where a customer can associate links to charge the phone from the battery charge. Only an authorised individual can use the generator for charging because the current is sent via (radio-recurrence ID) RFID cards. Using power from strides, we charge a battery, display it on an LCD using an arduino circuit, and explore portable charging through the arrangement. Our task model expense is effective and simple to implement, as well as environmentally friendly.

Paper 5: Footstep Power Generation using Piezoelectric Sensors
P.Venkatesh, M.Satyakalyanvarma, M.Sahil, P.Saiajay
The design of a power generation system using footstep based on accessible piezoelectric sensors is given in this study. Because the human species has required energy at a quick rate for their survival and well-being since their arrival on this planet, power resources have become depleted and enervated. Proposal for the employment and use of extravagant energy in human feet is very much to the purpose for highly populous countries such as China and India. Where the streets, rail, and bus stations are overcrowded and crammed with people moving around like sardines around the clock. So, by converting mechanical energy to electrical energy, electricity may be obtained and deployed utilising this approach.

Paper 6: Footstep Power generation System Using RFID for Charging,
Godithala Venugopala Chakri, GopaganiVamshi ,MohammadSohel , Mr. P Ravikiran
The goal of this study is to generate electricity from renewable sources. The piezoelectric sensors are used. Piezo sensors are positioned below the platform to generate a voltage from footstep. It also includes a USB mobile phone charging port where users may connect cables to charge their phones from the battery. Only an authorised user can use the generator for charging since the current is supplied using (radio-frequency identification) RFID cards. As a result, we charge a battery using the energy generated by footsteps, show it on an LCD using a Microcontroller circuit, and allow mobile charging through the arrangement.

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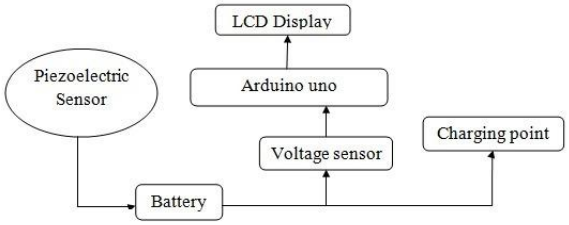
Paper 7: Power Generation Footstep

Shiraz Afzal, Farrukh hafeez.

The purpose of this study is to demonstrate how people can generate electricity by walking on the floor. Consider the forces you exert that are wasted when someone walks. The concept is to transform weight energy into electrical energy. The Power Generating floor's goal is to convert kinetic energy into electrical energy. The world's most pressing concern these days is the energy crisis. The goal of this study project is to find a way to deal with the situation. Though it will not meet the electricity requirements, if we are able to develop a power generating floor that can produce 100W in just 12 steps, we can make 1000 Watt in 120 steps, and if we install 100 floors with this method, we can produce 1 MegaWatt. Making it noteworthy is an accomplishment in and of itself.

III. FLOW CHART



IV. METHODOLOGY

Various methods were used to complete this research, including data collecting, data analysis, and data interpretation.

4.1 Data Gathering

This was focused with acquiring information that aided in the project's completion. When it comes to the design and implementation of the system, the data gathered is crucial.

4.2 Examination of Data

The data is mathematically examined to obtain the useful behaviours that are beneficial to the design.

4.3 Simulation and Circuit Design

Proteus software was used to model the circuit once the system was designed.

V. SYSTEM DESIGN AND IMPLEMENTATION

The System is divided into three major parts

1. Input
2. Processing
3. Output

1) A plate of piezoelectric crystals serves as the input block. When force is applied to the piezoelectric transducers, mechanical energy is converted to electrical energy. The generated electricity is subsequently sent to the processing block.

2) The processing block is made out of a single-ended diode and an Arduino Uno. This unit samples, amplifies, and directs the current created by the input block before sending it to the output unit.

3) The output block is made up of a battery that stores the current and an LCD that displays the results.

VI. SYSTEM DESCRIPTION

6.1 Piezoelectric Plate

The crystalline structure of Piezoelectric Material. It belongs to the ferroelectric material family. PVDF and PZT are the most widely used piezoelectric materials. It is critical to choose the finest piezoelectric material for obtaining higher output voltage under varying pressures.

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6.2 Arduino UNO Microcontroller

Arduino is a free and open-source platform for creating electronic projects. consists of a physical programmable circuit board (also known as a microcontroller) and a piece of software, known as an IDE (Integrated Development Environment), that runs on the computer and is used to write and upload computer code to the physical board.

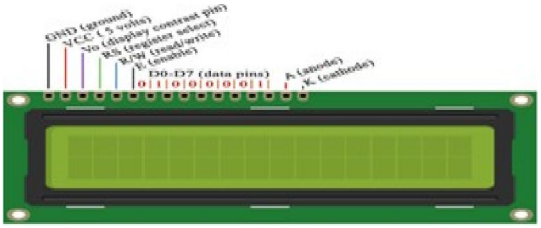
- Operating Voltage :5V
- Input Voltage: 6V-20V
- Digital I/O Pins: 14
- SRAM: 2 KB
- EPROM: 1 KB
- Analog Input Pins: 6
- Flash Memory: 32 KB

6.3 Filter Capacitor

By shorting AC signals to ground and enabling DC signals to flow to the regulator for further processing, it was used to remove ripples from pulsating DC voltage. Practical capacitors come in a variety of shapes and sizes, but they all have at least two electrical conductors (plates) separated by a dielectric (i.e. insulator). Thin films, foils, or conductive electrolytes, for example, can be used as conductors. Glass, ceramics, plastic film, air, vacuums, paper, and mica are all examples of dielectrics. The capacitor's charge capacity is increased by the non-conducting dielectric. An perfect capacitor retains energy in the form of an electric field between its plates rather than dissipating it.

6.4 Liquid Crystal Display

A Liquid Crystal Display (LCD) is a tiny flat panel made up of any number of colour or monochrome pixels filled with liquid crystals and placed in front of a light source (backlight) or reflector. Because it requires extremely little electric power, it is frequently used in battery-powered electronic gadgets.



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6.5 Inverter

An inverter is a piece of electronic equipment that transforms direct current (DC) to alternating current (AC) (AC). During the runtime, the inverter's operation is dependent on the electricity supplied by the battery.

VII. CONCLUSION

The paper provides an overview of the Advanced piezoelectric footsteps power generation system, which is designed to generate electricity using people's footfall. The developed system can be applied in a variety of crowd-moving environments.

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