ENERGY HARVESTING WHILE WALKING

Sushmitha Suresh ,Suchithra M B, V Yashwanth Naidu, Vikrama C, Vishwanath vivek
Assistant Professor, Student, Student, Student, Student,
Computer science Engineering,
K S SCHOOL OF ENGINEERING AND MANAGEMENT

Abstract - This device uses a unique "controlled slip" technique to create electricity from human movement. It accomplishes this by combining piezo sensors with an advanced footstep energy conversion mechanism. These sensors, which are placed beneath a plat- form, maximize the voltage output by creating energy in reaction to footfall. The voltage and step count on the loaded platform are recorded and measured by a microcontroller-based monitoring circuit.

Keywords - Piezoelectric sensors, battery ,voltmeter , adrino-uno board.

I INTRODUCTION

The goal of the suggested system is to use a novel "controlled slip" technique to produce power from human movement. This technique uses a sophisticated footstep power generation system with piezoelectric sensors. These sensors maximize voltage production by producing energy in reaction to footsteps when they are placed strategically beneath a platform. The voltage and step count on the weighted plate are detected and measured by a monitoring circuit that is built around a microcontroller.

The main goal of this system is to produce electricity via a non-conventional method—that is, by using the basic action of jogging or walking over footstep surfaces. The application of a method that generates electricity from human motion is made possible by the use of piezoelectric sensors, which are essential to this project due to their capacity to display the piezoelectric effect.

Size and battery capacity restrictions for wearable devices frequently impede their progress. Nonetheless,they possess the capability to improve recovery and general wellbeing. One significant energy source that can be used in place of or in addition to batteries in body- worn devices is human movement.

The premise behind this particular energy harvesting technique is that a large mass is suspended on a suspension; when the mass accelerates, it deflects the suspension, which produces power. The idea is to create a gadget that makes use of unconventional sources to generate electricity from the force of a individual's footfall and saves it for later usage. The system's piezoelectric sensors will translate force, pressure, and acceleration data into electrical impulses. Its operation depends only on the force generated by walking people, which it transforms into practical strength.

The proof mass's weight establishes how effective this energy harvesting method is, as well as how much work is required of the user to capture vibration energy. Because of this, it works best in circumstances requiring minimal energy consumption output or when carrying big items, similar to a backpack.

In conclusion, this model uses a special "controlled slip" technique in an attempt to harness the energy involved in human motion. Footstep energy is captured using a sophisticated a footstep-based power production device using piezo sensors. The sensors are positioned below a platform in a strategic manner to maximise voltage production by producing electricity in reaction to footsteps. The voltage and step count on the detection of the weighted plate and measured by a circuit for monitoring that is built around a microcontroller.

II LITERATURE SURVEY

2.1 Power Generation through Footsteps using Piezo-Electric Sensors and GPSTracking:

As a reaction to the increasing energy demands and limited resources, this approach proposes harnessing human energy through a a footnote power generating apparatus that utilizes the piezoelectric effect. This system converting motion energy into electrical energy by generating AC voltage from footsteps, thereby enabling the capture and use of energy that would otherwise be wasted.

2.2 Footstep Power Generation System:

In the face of growing power demands, The demand for alternative energy sources is growing. become increasingly crucial. Although solar and wind energy have gained popularity, they continue to show inadequacy and lack energy. is lost through various channels. To address this, our approach proposes embedding floor-mounted piezoelectric sensors, especially in places with high population density, to absorb the energy produced by moving humans. These sensors detect pressure from footsteps, making them a reliable power generation method that is not affected by environmental pollution or climate change. This technology offers many cost- effective applications, making it a promising solution for the future .

2.3 Generation and Utilization of Electricity using Footsteps as a Source of Energy:

The significance of power access in modern life cannot be overstated, given its critical role in powering essential functions that consume a substantial amount of electrical energy. However, the dramatic increase in global energy consumption has had a direct impact on the environment as a result of relying on conventional electricity generation methods. With growing concerns about the negative environmental impact of traditional electricity generation methods, there is a growing interest in harnessing human energy, an underutilized resource for centuries, to develop robust techniques for electricity generation. This shift towards harnessing human energy is driven by the need to reduce the adverse environmental effects of conventional electricity generation methods.

2.4 Development of a Power-harnessing Smart Shoe System with Outdoor Navigation:

The proposed smart shoe system, powered by an Arduino UNO microcontroller, aims to revolutionize outdoor navigation by minimizing the reliance on traditional maps and enhancing convenience. The system features vibration motors that serve as tactile output signals, guiding users in the desired direction. Energy is generated through a "controlled slip" method utilizing piezoelectric crystals as pressure sensors positioned beneath a platform.

The system measures voltage output from the piezoelectric sensors and step count on the weighted plate using a monitoring circuit based on the microcontroller. This setup allows for energy harvesting from footsteps, providing a sustainable power source for the smart shoe. Furthermore, the system incorporates GPS tracking, making it an ideal solution for modern life's navigation challenges.With the added benefit of a dedicated mobile application, the system offers precise and tailored solutions to streamline user navigation. The Bluetooth module facilitates seamless communication between the mobile application and the smart shoe, allowing for remote control and customization

III REGISTRATION PHASE

[A] Working-Flow of Application

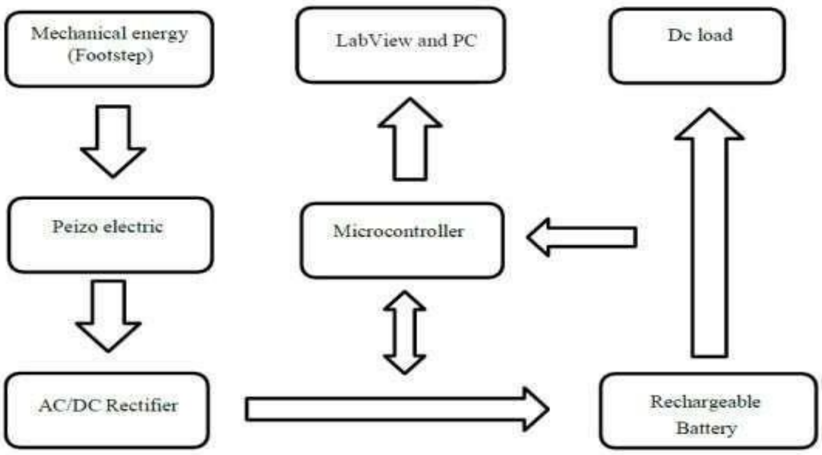

Fig 6.1.1 Flow chart of the application

- During the investigation of diverse piezoelectric sensors, various configurations and materials were studied to maximize current production and output. Initially, multiple piezoelectric plates were connected sequentially, but to boost output, theconnections were altered to parallel.
- Different materials, such as fiberglass and wooden plates The potential of the subjects was assessed. to generate electricity. Throughout this exploration, the Arduino UNO, a highly adaptable microcontroller, was employed to manage and coordinate several tasks critical to the system's functionality.
- The primary objective of this investigation was to explore the potential applications and optimizations of piezoelectric sensors in different scenarios. This research on piezoelectric sensors could pave the way for innovative and sustainable energy-harvesting solutions in fields such as wearable technology, robotics, and smart infrastructure.
- In conclusion, the investigation of piezoelectric sensors involved examining various configurations, materials, and a programmable microcontroller to study potential applications and optimizations. This research could contribute to new possibilities for energy harvesting and sustainable power solutions in various industries.

[B] Block Diagram

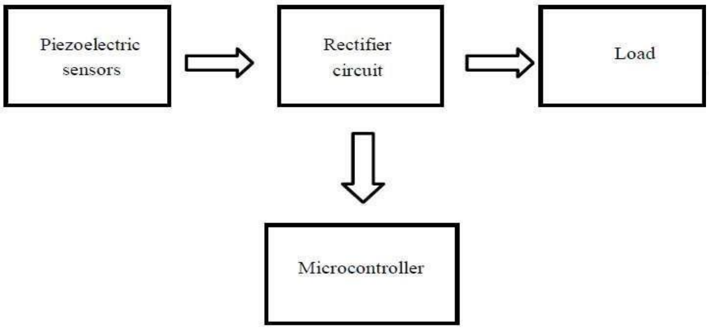

Fig 6.2.1 Project block diagram

- The task has been split into two parts. subsystems, with the intention of addressing each one in separate semesters. This semester will be dedicated to the weighing machine, while the microcontroller will be tackled in the following semester.
- The goal is to finish work on the weighing machine by the end of this semester to ensure a smooth

transition to the second subsystem in the next semester.

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IV CONCLUSION

The integration of piezoelectric technology into daily activities, particularly in the context of energy generation from walking, has gained prominence due to its potential environmental and societal benefits. By incorporating piezoelectric materials into footwear, walkways, and flooring surfaces, human motion can be harnessed as a renewable energy source. These materials generate electricity as a reaction to mechanical strain, enabling the conversion of walking motion into usable energy. This innovation holds immense potential, addressing two critical issues: reducing environmental impact and meeting escalating energy demands.

The primary social advantage of harvesting energy from walking using piezoelectric methods is the promotion of clean and sustainable energy sources. As individuals move about in public spaces, each step generates a small but consistent amount of electrical energy. At a larger scale, in commercial areas with a high population density, transit hubs, and urban landscapes, this collective effect can accumulate significantly. The generated Energy is put to various uses, such as powering public advertising displays, streetlights, and charging stations for electric vehicles. By leveraging the kinetic energy produced during walking, communities can become less reliant on traditional grid-based power sources, thereby enhancing energy independence and resilience.

In summary, integrating piezoelectric technology into footwear, walkways, and flooring surfaces represents an innovative and promising approach for converting human motion into usable energy. The societal benefits of this technology are substantial, as it promotes clean energy sources, enhances sustainability, and reduces dependence on traditional power sources, contributing to energy independence and resilience in communities.

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