Smart Foot Steps Power Generation System

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***Abstract* - Due to the rising demands placed on the electricity distribution system day by day as a result of population growth, the production of electricity has recently become a more significant component of the power system. As a result, everyone was aware that there are numerous techniques and methods for producing power. The technologies for producing electrical energy, which arefrequently fuel-consuming devices, have been developed by many electrical professionals. This new method for using piezo sensors to produce electricity. The frequency of various unnecessary vibrations will be converted into AC power here with the assistance of a number of vibrating plates, which are aptly described as piezo sensors, and will then be further converted into direct power using an ultrafast switching diode.**

I. INTRODUCTION

A. Background of the work

People need and consume more energy on a daily basis. As a result, a great deal of energy is used up and lost. For densely populated countries with roads, train stations, bus stops, temples, etc., the use of residual leg strength energy for human locomotion is crucial. If unused biological energy from humans could be used, that would be very advantageous. energy supply. The most frequent daily activity is walking. Walking causes vibrations that are lost as energy on the ground. It is possible to

capture and transform this energy into electricity. Piezoelectric crystals are utilized as the carrier in this system's design. Mechanical vibrations are converted into electrical energy by these piezoelectric crystals. People need and consume more energy on a daily basis. As a result, a great deal of energy is used up and lost. For densely populated countries with roads, railway stations, bus stops, temples, etc., the use of residual leg strength energy for human locomotion is crucial. If the wasted biological energy from humans could be put to good use, that would be very advantageous. energy supply. We gain energy by walking in a certain way, such as placing our feet on piezo bricks and using stairs as a renewable energy source to generate energy. Piezoelectric sensors are used in the cutting-edge progressive energy generation system that is presented here. Piezoelectric sensors are mounted beneath the platform to produce the voltage needed for the steps. The sensors are arranged in this way to produce the highest output voltage possible. The monitoring circuit receives this and transmits it. This supervisory circuit, which is microcontroller-based, enables the user to keep an eye on the charge and voltage of the connected battery. This power supply can be used for a variety of purposes. Additionally, it displays the load that our actions have generated on the LCD screen. Additionally, it has a USB phone charging port to which users can connect a cable in order to remove their phone from charging. RFID (radio frequency identification) cards are used to distribute electricity, so only authorized personnel are allowed to use the generator for recharging. Therefore, we use the energy from the rails to charge the battery, a microcontroller circuit to display it on the LCD, and settings to enable mobile charging. Our cost models are effective, simple to use, and eco-friendly. Walking causes vibrations that are lost as energy on the ground. It is possible to capture and transform this energy into electricity. Piezoelectric crystals are utilized as the carrier in this system's design. Mechanical vibrations are converted into electrical energy by these piezoelectric crystals. The project is made up of a number of straightforward installations and parts that are placed beneath a platform for standing or walking. On this platform, people can stand or walk, and their body weight compresses the system settings to rotate the generator. The generated current is then stored in the dry battery, and the platform's population moves to produce high energy. More activity generates more energy. All of this wasted energy from the human skeleton could be used to power a sizable energy-generating platform, which would be especially helpful in crowded areas. With this process, electricity is produced without harming the environment.

Renewable and continuous energy is used. Energy is simply the capacity to perform work. Power is now used for the benefit of humanity. Its demand is quickly expanding. Modern innovations require a lot of electrical power for a variety of purposes. The primary cause of pollution in the world is the production of electricity. Numerous energy resources are produced as a result and then wasted. Typically, energy comes from resources like coal, water, and wind. In order to produce electricity from these sources, it is necessary to build sizable power plants that require upkeep. students. In a similar vein, current research aims to develop power generation technology that doesn't deplete natural resources, enabling steady population growth. The invention is based on the piezoelectric effect, a law that states that certain materials can produce an electrical charge when weight and voltage are applied. Due to the piezoelectric effect, specific materials can produce an electric charge in response to mechanical stress. A piezoelectric material experiences this effect, which transforms mechanical vibration, pressure, or strain into electrical form. The term "piezoelectricity" describes a material's capacity to create an electrical potential at the surface of a mass that is attached to it. Piezoelectric materials that are embedded in objects can magically transform the force that a person exerts when they move into electrical current that is then stored in a battery and distributed using an RFID card. Energy is something that man uses and needs more of each day. Numerous energy resources have been used up and wasted as a result. In densely populated countries with roads, train stations, bus stops, temples, etc., using waste energy from human movement is crucial. If allowed to be used, the wasted human bio-energy will be very beneficial. energy supply. The most frequent daily activity is walking. Vibrations from walking cause a person to lose energy to the ground. This power can be captured and transformed into electricity. Piezoelectric crystals were employed as the mediumin this system's proposal. Mechanical vibrations are converted into electrical energy by these piezoelectric crystals.

II. LITERATURE REVIEW

IoT-based power generation systems have been proposed in several studies in the literature. Here is a comparison of all of these pieces of writing. The discussion of the most significant research gaps found follows this section.

A system to generate electrical energy from stairs was suggestedby Modi et al. [4]. Two L-shaped mild steel frames that are attached to castings make up the prototype. This guidance led tothe creation of a workable piezoelectric sensor-based energy- generating device. Up to 12 V DC can be produced by the prototype. A lead acid battery stores this DC voltage. Theinverter is linked to the battery. To power light bulbs, fans, etc.,this converter transforms direct voltage into 230 V of alternating voltage.

The aforementioned article describes a simple piezoelectricsensor-based system. A unique arrangement that Asry et al. describe in [5] can increase output. In response to the piezoelectric transducer's bending or bending, they developed a 3D model that serves as a support. When laying bricks underfoot in crowded areas, benders can be used to boost the output of piezoelectric transducers and capture energy from walking motion. In comparison to unstressed piezo, this pre-stressed piezo bender seeks to maximize and further enhance the poweroutput produced by piezo. The proposed mechanism allows thepiezoelectric device to harvest about 70 VAC when measured in an open circuit, and when rectified into a 700 load, it can produce a maximum DC output of 53 mW.

As demonstrated by Adithan et al. [6], Peltier sensors can be used in conjunction with piezoelectric sensors to produce extra energy. Information about the energy produced by this additional arrangement is not, however, included in the publication.

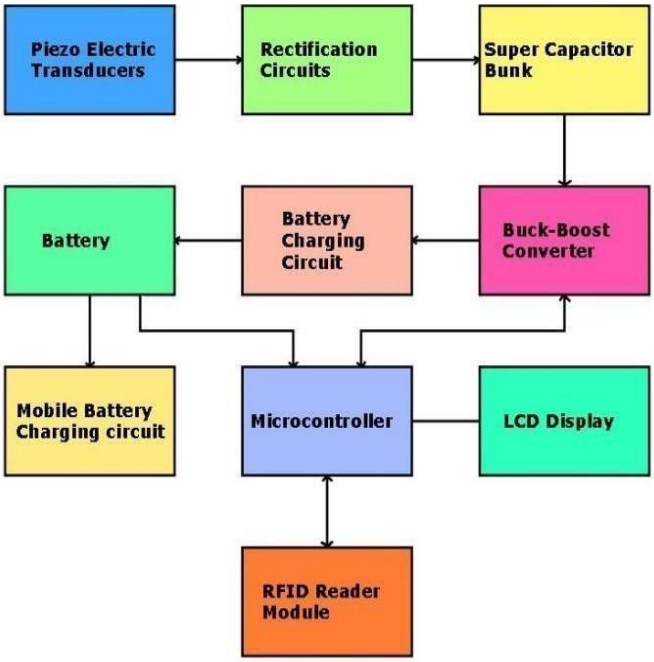
Pure hardware circuits devoid of programmable components are used in the systems developed in [4], [5], and [6]. Using an Arduino Uno, Dhanalakshmi et al. [7] created a pedal power generation system. The piezoelectric sensor assembly has a 40 V DC maximum output capacity. The AT89s52 MCU is also used by [8] to create the power system. However, in both systems, the controller is used to locally display the current load, and we believe this underutilizes its processing power.

Veena et al [9] .'s method of amplifying and rectifying the electrical energy produced by the ARM microcontroller improved accuracy, but the system is standalone and requires manual upkeep. The builds covered in this section were initially entirely hardware-based and lacked any programmingcapabilities.

III. SYSTEM OVERVIEW

Figure 2 shows that the primary working criterion for this project is the piezoelectric effect attained through the use of piezoelectric sensors, which convert the applied pressure into electrical energy. The weight of the person walking on it couldbe the cause of the stress. The piezoelectric material produces an erratic output rather than a DC one. In order to convert the generated voltage into DC voltage, we, therefore, use a rectifiercircuit. For direct storing in the battery, the converted voltagesare too low and brief. Therefore, the short voltages are stored in supercapacitors before being transferred to a buck-boost converter. The boost converter's internal circuitry will expandthe voltage range and enable battery charging. The microcontroller will keep track of all power generation activities, buck converter power conversion, and battery

FIGURE 1: RFID card reader



System.

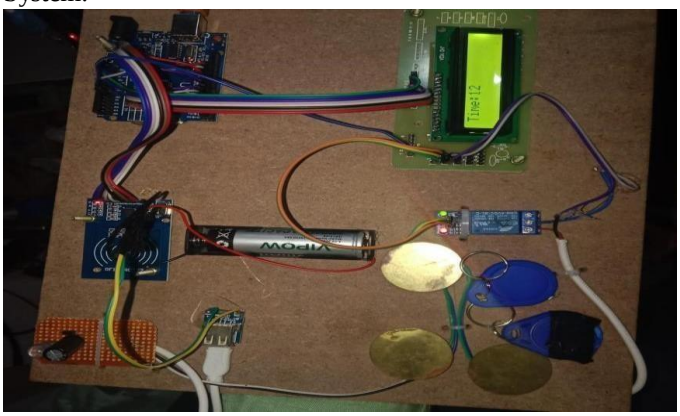


FIGURE 4: Implementation of the final design

FIGURE 2: BLOCK DIAGRAM OF ADVANCED FOOTSTEP POWER GENERATORUSING RFID CARD.

health. The LCD screen is used to display these details on the screen. We've used RFID cards to guard the system against unauthorized access.

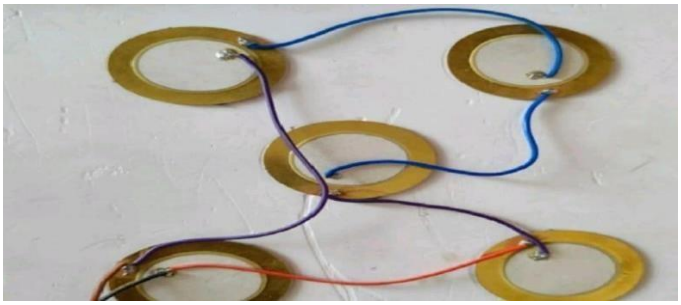


FIGURE 3: Piezo Electric plates Implementation

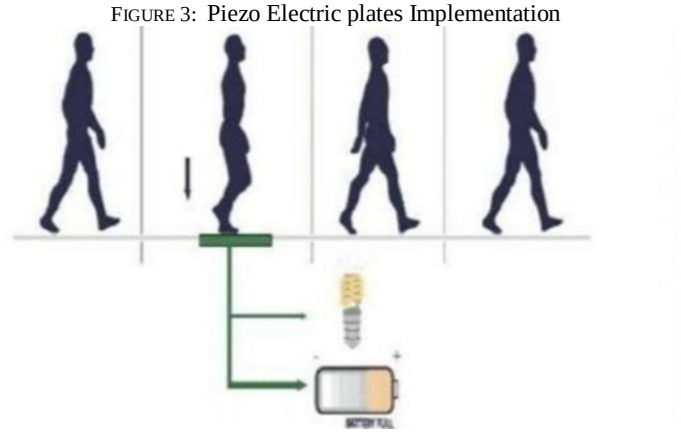


FIGURE 4: Energy harvesting

Users must register and get an RFID card in order to access it.The user can charge their phone by choosing the appropriate USB data cable once they have successfully logged into the

IV.RESULTS AND DISCUSSIONS

We applied five piezo pick-ups over a space of one square foot.Since the power generation of piezo pick-ups varies withdifferent steps, we support the average with a minimum voltage of 1 volt and a maximum voltage of 10.5 volts per step. The average calculation shows that 800 steps are needed to increase the battery charge by 1 volt (v) when the pressure is 50 kg for a single person. As a result, 9600 steps are needed toincrease a 12-volt battery.

We move an average of two steps in one second when runningour project quickly in a crowded area with stairs as the source.The time needed for 9600 steps is equal to 9600/ (60*2), whichis 80 minutes (approximately).

Weight	Power
50	0.6
60	0.85
70	0.9

TABLE 1: RESULT TABLE

V.CONCLUSION AND FUTURE SCOPE

A. CONCLUSION

The projects were successfully tested and put into action, whichis the best response to the conservative and reasonable vitality of our country's common citizens. It can be used to manage some applications in remote, inhospitable, or unrelated rural areas. Vitality management is a significant test for a hugepopulation, even in India, a creative nation. This task will allowus all to ACC. A DC load is also indicated by the power supplythat we connect to the piezoelectric sensor. The technology lowers the need for pollution-free control, enabling efficient power generation in nations with dense populations. Only 11% of the energy we use is renewable.

B. FUTURE SCOPE

An innovative and eco-friendly technology, the intelligent stepping energy generation system, transforms the kinetic energy produced by human steps into electrical energy. Particularly in high-traffic areas like shopping centers, airports,and train stations, this technology has the potential torevolutionize the way we produce and use electricity.

Here are a few potential futures for clever steppers:

1. Integration with the Internet of Things (IoT): Smart steppers can be connected to a central server and remotely managed thanks to IoT. This will make it possible to monitor, manage, and optimize the system for maximum effectiveness.
2. Application of wearable devices: This technology can be incorporated into footwear or jewelry, such as bracelets or rings, to produce electricity for the use of the accessories. Batteries or charging won't be necessary as a result.
3. Integration with smart cities: Streetlights, traffic lights, andother utilities in smart cities can be powered by systems forsmart-stepped electricity generation. As a result, there will be less reliance on traditional energy sources, making the city more environmentally friendly and sustainable.
4. Implementation in rural areas: This technology can also be used in rural areas without electricity. Lighting and small appliances can be powered by the smart power generation system, raising the standard of living for those who live in these areas.
5. Cooperate with renewable energy: A hybrid power system can be created by combining the intelligent power generation system with other renewable energy sources likesolar energy and wind energy. As a result, there will be a steady supply of electricity and less reliance on non- renewable energy sources.

The smart foot power generation system has a vast amount of room for future development, and it could significantly alter how we produce and use electricity. We can anticipate seeing more cutting-edge applications of this technology across a rangeof industries as technology develops.

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