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Footstep Power Generation System For Mobile Charging Using RFID

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Abstract: The increasing population of the country demands more power requirement. At the same time the wastage of energy also increased in many ways because of new life style of living. So, reforming this energy back to usable form is the major solution. As technology is developed and the use of gadgets, electronic devices also increased. Power generation using conservative methods becoming deficient. There is a necessity arises for a different power generation method. At the same time the energy is wasted due to human locomotion and many ways. To overcome this problem, the energy wastage can be converted to usable form using the piezoelectric sensor. This sensor converts the pressure on it to a voltage. By using this energy saving method that is the footstep power generation system we are generating power.

In this project we are using the generated power to charge the mobile phones in the public places like bus stops, metro stations and also in railway station. Each registered persons will have RFID card with them by using that card a person can charge his phone by tapping the RFID card to RFID card reader, by doing so the recharge in that card will be deducted and charging will turn on for particular time period.

Index Terms - Piezoelctric sensor, RFID, Arduino UNO

I. INTRODUCTION

Now a day's energy is one of the most important issues around the world. Especially in India energy crisis is a big problem. Renewable energy sources can be a great media to solve this energy crisis problem in India. As we know natural resources will finish one day. That's why researchers are trying to introduce substitute energy sources from nature that must be green and not harmful for the environment. Energy harvesting is defined as capturing minute amounts of energy from one or more of the surrounding energy sources. Human beings have already started to use energy harvesting technology in the form of windmill, geothermal and solar energy. The energy came from natural sources, termed as renewable energy.

Renewable energy harvesting plants generate KW or MW level power; it is called macro energy harvesting technology. Moreover, micro energy also can produce from those natural sources that are called micro energy harvesting. Micro energy harvesting technology is based on mechanical vibration, mechanical stress and strain, thermal energy from furnace, heaters and friction sources, sun light or room light, human body, chemical or biological sources, which can generate (milli watt) mW or (micro watt) µW level power. Micro power supply needs increasing greatly with time as our technology is moving to the micro and Nano fabrication levels. It is essential to generate micro energy from vibration and pressure using piezoelectric material. Waking is the most common activity in day-to-day life. By walking some energy losses in form of impact, vibration, sound etc. This mechanical energy can be tapped and convert into electrical energy.

The process of producing electrical power from different types of energy sources is called electricity generation. This type of energy is an essential part of nature. We generate electricity (secondary energy source) by converting primary sources of energy like atomic, gasoline, coal, and other natural sources. Fossil fuels pollute the environment. Atomic power plant requires careful handling of both raw as well as waste material. From the birth of earth, man has needed and used energy at an increasing rate prior to his

existence. The world has already used large amount of energy resources for power production. After realizing the availability issues of the non-renewable sources, the renewable sources of energy like wind, water, and sun are being consistently and increasingly used by people to generate power. Therefore, our focus now is on the renewable energy, which is essential and non-polluting.

II RELATED WORK

Following is an extract of the information of the material collected during literature survey. Literature survey is a methodology of identifying the problems in the existing system through research and proposing the development of the system to solve the problems of existing system.

Power Generation from Steps by Ramesh Raja R, Sherin Mathew - February 2014. This research paper attempts to show how energy can be tapped and used at a commonly used floor step. The usage of steps in every building is increasing day by day, since even every small building has some floors. A large amount of energy is wasted when we are stepping on the floors by the dissipation of heat and friction, every time a man steps up using stairs. The generated power can be stored by batteries, and it will be used for lighting the building [1].

According to **T.R.Deshmukh** describe with design and modeling of parts of the model of the foot step power generation system using 3D modeling software creo. This process consist number of simple setup that is installed under the walking or standing platform. Project system works on the principle of converting the linear motion because to pressure of footsteps into rotating motion by rack and pinion arrangement. This mechanism fails if there is any occurrence of variable load leads to balancing type problems. Power is not generated during return movement of rack [2].

Harvesting kinetic energy of footsteps on specially designed floor tiles by Daifallah Dalabeih et.al. This paper introduces an exploratory model for utilizing the kinetic energy of footsteps. The model consists of three wood layers. The bottom and top layer having the same dimensions are connected through springs. The use of springs makes walking on the tile flexible. The middle layer is installed with the 35 Piezoelectric units connected in series/parallel connection [3].

Advanced Foot Step Power Generation System using RFID for Charging by Shradha P et al - February 2020. This project described the mechanical energy is converted into electrical energy by using the piezo electric sensor and then it is stored in the battery. RFID is the sensor used for phone charging purpose. RFID card is used to charge the mobile phones [4].

Piezoelectric Based Automatic Generation Using IOT by Ambrish R et al – March 2019. This paper was generated in order to generate renewable electricity and reduce energy waste. A greater number of pedestrians use the subway, stairs, and highways, causing vibrations under the floors. IoT connected to piezoelectric material monitors energy generation and is linked to a multi- control device for wireless network communication with a computer or cell phone [5].

Power Generating using Human Foot Step with Piezo Electric Sensor and Treadmill by Gopinath R et al - 2018. The proposed system describes the electrical energy is generated by walking in tread- mill which is rotating in the circular motion the electricity is produced and that energy is stored Footstep Power Generation System for Mobile Charging using RFID Dept of EEE, GSSSIETW, Mysuru Page 3 in the battery and used for future purpose [6].

III.OBJECTIVES

1. To build the foot step electricity generation system.
2. The generated power is used for charging the mobile phones in the public place using RFID card.

Iv. METHODOLOGY

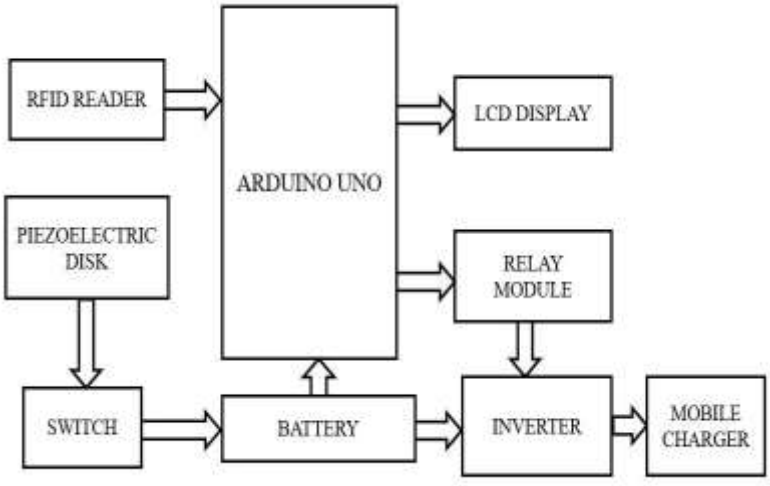

Figure 1.1 Block diagram of footstep Power Generation

The working model of Footstep Power Generation is demonstrated in this project, the basic working of this model has been presented as a block diagram as shown in the figure 1.1. To implement this model piezoelectric sensor that is connected in series to increase the voltage output, this sensor generates AC voltage which is transferred to the bridge rectifier. The output voltage from the sensor can be of two types because it produces AC voltage:

a) Positive: When positive voltage is received then it is passed into the forward bias mode which will in turn charge the battery.

b) Negative: When a negative voltage is received then it is transferred to the reverse bias of the bridge rectifier.

This way no voltage loss is observed during a complete cycle. An additional resistor of 470 Ohm is placed in series along with a capacitor of 4.7 mF with the LED to make the glow more noticeable

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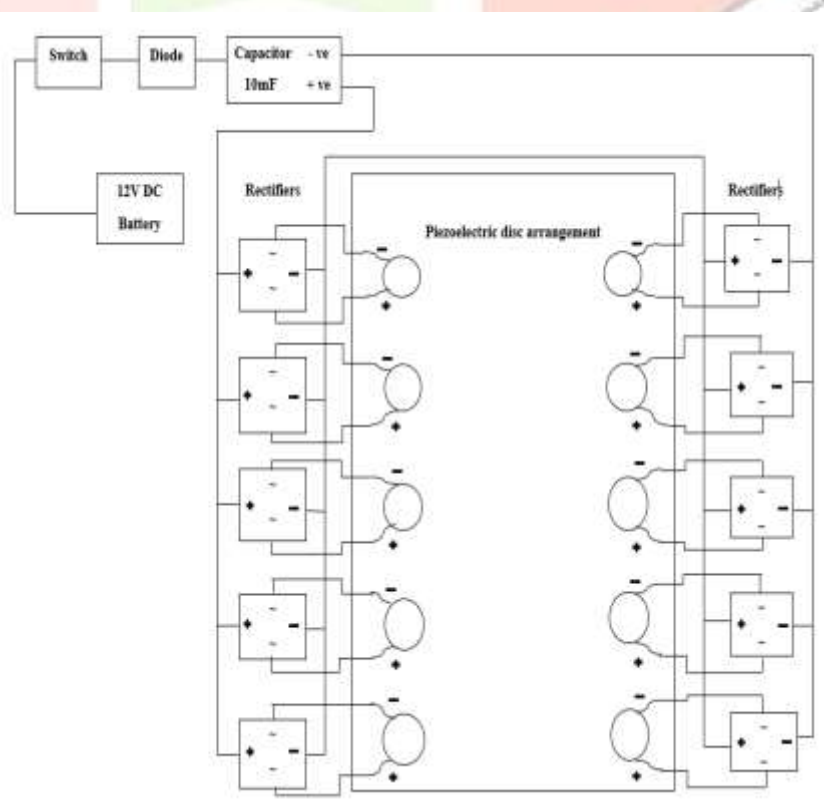

Figure 1.2 Piezoelectric Circuit connections to the Battery

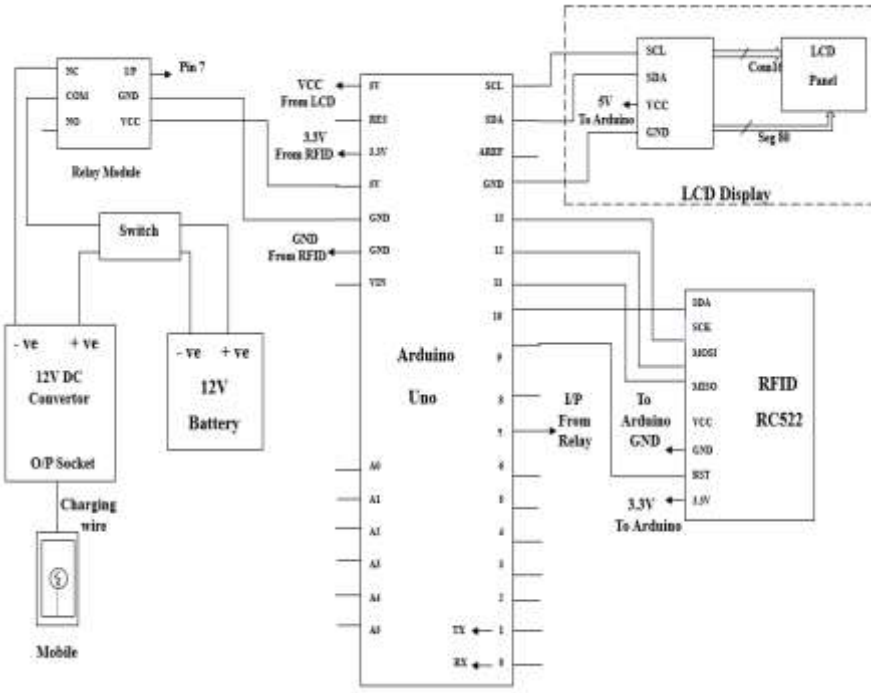

Figure 1.3 Mobile charging circuit connection using RFID card

When the person walks on the steps he transfers his energy in a form of impact, vibration, sound etc. Piezoelectric sensors which will be connected in series and parallel combination tap this mechanical energy and convert into electrical energy. The polarity of charge depends upon whether element is under compression or tension as a result of applied force. If the element is subjected to an applied compressive force its polarity will be positive and due to applied tensile force it will be negative. This element generates the electrical charge. The produced output is in the variable form so bridge rectifier is used to convert AC into DC. The remaining AC will be converted and neutralized by capacitor. Capacitor will be grounded if AC is present and we will obtain pure DC. This is fed to IN4148 diode which makes current to flow in one direction and it will fed to microcontroller. The voltage produce across the time can be displayed on LCD. Capacitors store the power which is connected to loads. The process charges the battery, an inverter ups is connected to the battery which gives 220V AC output to which computers, lights, tv can be connected. In this project we are connecting mobile charger to charge the mobile phones in public places using RFID card.

Iv. HARDWARE DESCRIPTION

Hardware components used to build the footstep generators are listed below

- Arduino UNO
- Piezo Electric disc
- Battery
- UPS inverter
- Bridge Rectifier
- 16X2 I2C LCD
- Relay Module
- RFID Card & Tag

1. Arduinio UNO

Arduino UNO is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53R0), a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started

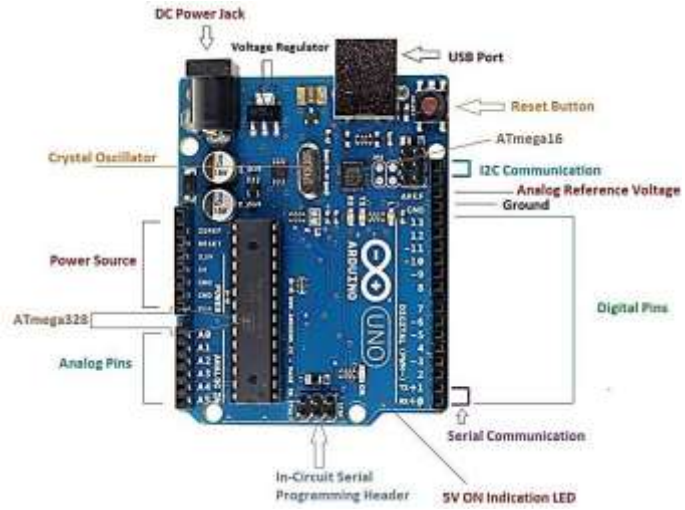

Figure 1.4 Arduino UNO

2. Piezoelectric disc

A piezoelectric disc is a small, thin disc-shaped device as shown in figure 3.2 made from piezoelectric materials, which generate an electric charge when mechanical stress is applied. These discs are commonly used in various applications such as buzzers, sensors, actuators, and even as components in musical instruments. They're valued for their ability to convert mechanical energy into electrical energy and vice versa. Piezoelectric discs are typically made from materials such as quartz, ceramics (like lead titanate), or certain polymers. These materials have asymmetric crystal structures, allowing them to generate electric charge when mechanically deformed. When a mechanical force is applied to a piezoelectric disc, it causes the material to deform, which results in the displacement of positive and negative charges within the material, generating an electric potential across the disc. Conversely, when an electric field is applied to the disc, it causes mechanical deformation, known as the piezoelectric effect.

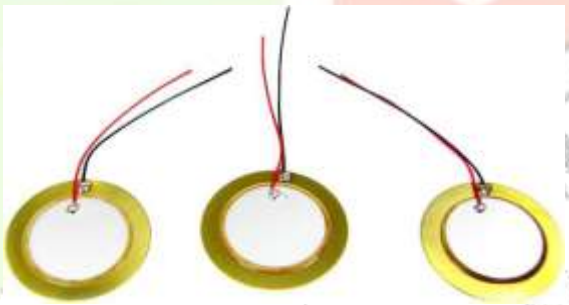

Figure 1.5 Piezoelectric disc

3.Lead acid Battery

A lead-acid battery (Figure 3.3) is a type of rechargeable battery commonly used in vehicles, uninterruptible power supplies (UPS), and other applications. It consists of lead dioxide (positive electrode), sponge metallic lead (negative electrode), and sulfuric acid electrolyte. Lead-acid batteries are known for their relatively low cost, high surge current, and ability to provide high current for short durations, making them suitable for applications where a large current is required. However, they have a lower energy-to-weight ratio and energy-to-volume ratio compared to other types of rechargeable batteries like lithium-ion. They also require regular maintenance, including topping up electrolyte levels and equalizing charges toprevent sulfation and maintain performance.

4. Relay Module A relay module is an electromechanical device that allows you to control high-power circuits with low-power signals, like those from a microcontroller. Relay module used in this project is shown in figure1.6. It typically consists of a coil, which when energized, creates a magnetic field that switches the contacts of the relay, allowing or interrupting the flow of current to the controlled circuit. This

makes it useful for applications where you need to isolate the controlling circuit from the high-power circuit, like in home automation, robotics, or industrial control systems.

Figure 1.6 Relay Module

VI. RESULTS

- In this project we have piezoelectric disks embedded in public spaces harness kinetic energy, converting it into electricity stored in batteries.
- Users can access this power with RFID cards for mobile charging, with amounts deducted accordingly.
- The 12V Voltage is generated by the piezoelectric sensors which is shown in figure 1.7

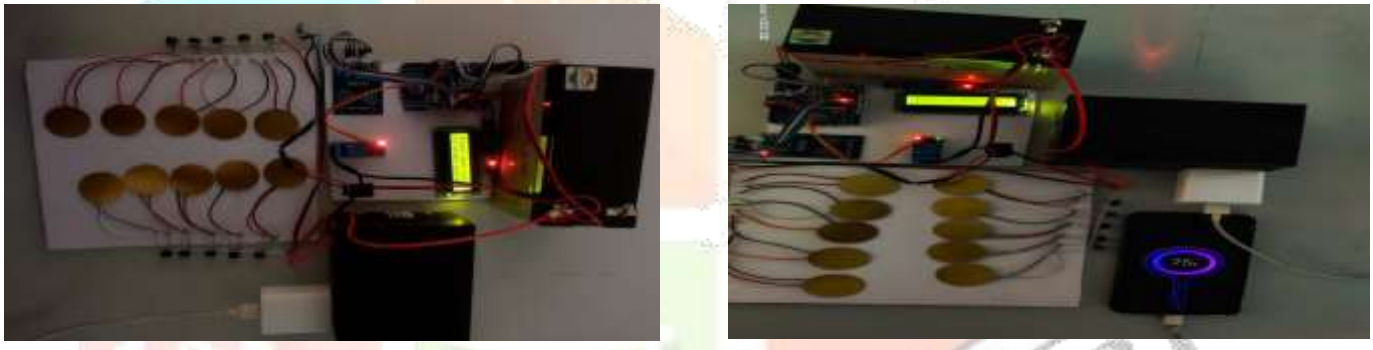

Figure 1.7 Mobile charging using RFID card from generated power

VII CONCLUSION

The voltage is generated by applying pressure on any surface engineered with piezo materials hence this project can utilize the energy from areas experiencing pressure by some or the other means. Footstep Power Generation System for Mobile Charging using RFID

REFRENCES

[1]. Ramesh Raja R, Sherin Mathew. “Power Generation from Staircase (steps)”- International Journal of Innovative Research in Science Engineering and Technology, vol.3, Issue 1, February 2014.
[2].T.R.Deshmukh. “Design and analysis of a Mechanical Device to harvest energy from human footstep motion”, Volume 3, Special Issue 1, ICSTSD 2016.
[3].Harvesting kinetic energy of footsteps on specially designed floor tiles Daifallah Dalabeih ; Batool Haws ; Sawsan Muhtaseb 2018 9th International Renewable Energy Congress (IREC).
[4].Shradha P, Pratik B, Hemant C. "Advanced Foot Step Power Generation System using RFID for Charging”, International Research Journal of Engineering and Technology 2020 Feb:07(02) 2408-12.
[5].Ambrish R. Ashwini S. Dharun Surya MK. Karthick M. Kalaikumar T, “Piezoelectric Based Automatic Generation Using IOT”. In2019 Second International confrence on Nextgen Technologies. 2019 Mar (pp.179-185).
[6].Gopinath R. Lavanya M. Arivalagan M. “Power Generating using Human Foot Step with Piezo Electric Sensor and Treadmill”. International Journal of Pure and Applied Mathematics. 2018;119(16):3171-82.
[7]. P.R. Magdum, Chikhale, S. J., Rajole, A. S., & Jedhe, S. S. (2017). “Generation of Electricity by Using Footsteps as a Source of Energy”. IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE), 50-56.

[8].Alla Chandra Sekhar, B Murali Kishore, T Jogi Raju, "Electromagnetic Foot Step Power Generation". International Journal of Scientific and Research Publications, Volume 4, Issue 6, June 2014.
[9].Dr. B. Mouli chandra, C.H. Ajitha, O. Pavan kumar, B. Abhishek, T. Venkata Sivamani, C.H. Mamatha. "Footstep Power Generation using Piezoelectric Sensors". South Asian Journal of Engineering and Technology 12(2):50-53, May 2022.
[10].Shiraz Afzal and Farrukh hafeez "Power Generation Footstep". International Journal of Advancements in Research & Technology, Volume 3, Issue 4, April 2014.
[11]. Arvind, Asha, Jilu Joy, S. Sreekalpa, S. Sujith, and Resmi Ramakrishnan "Power Generation through Human Locomotion", Journal of Electronics and Communication Systems, vol. 1, no. 1, pp. 1-9, 2016.
[12].Tom Jose V,Binoy Boban, Sijvo MT, "Electricity generation from footsteps; A Generative energy Resources", International journal of scientist and research Publication, pp 1-3,March 2013.