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HUMAN FOOTSTRESS ELECTRICAL ENERGY HARVESTING SYSTEM USING PIEZO ELECTRIC SENSOR TECHNOLOGY

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ABSTRACT

This innovative system harnesses the mechanical energy generated by the foot pressure during walking produces electrical energy through the piezoelectric crystals embedded in the floor. The generated energy is used to charge a mobile. This solution offers practical way to harvest renewable energy from human movement and also address the growing need of mobile charging.

I. INTRODUCTION

The need for electricity is constantly growing, and modern living makes extensive and flexible use of it. Walking is the most popular human activity. Every day, humans walk for a short time, and the energy they lose by walking is tapped and converted into electrical energy. For densely populated countries like India, implementing waste energy produced by human motion is critical. Many villages in India also lack access to electricity. Rather than focusing on conventional oil, we are now focusing on non-conventional energy. Conventional energy consumption is roughly equivalent to non-conventional energy usage. As a result, we will reduce waste that is detrimental to the atmosphere while still saving money. It is highly recommended because it is a one-time investment. In this project, we primarily aim to capture power produced by human motion using a piezoelectric sensor, then move the power to a battery, to produce voltage. Bus stops, theaters, train stations, malls, and other public places can significantly profit from this endeavor.

II. LITERATURE REVIEW

A. FOOTSTEP POWER GENERATING SYSTEM

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. The system proposed 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 in the battery and used for future purpose .This system describe 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 .The prototype design and testing of a hybrid power management system for a wireless sensor mote is designed . The sensor mote, which is installed on the outside of a high voltage transformer, generates electricity from the transformer tank vibration using a piezoelectric cantilever. The authors of proposed a decision-making procedure to assist a city energy manager in evaluating the most cost effective energy retrofit plan for an existing public street lighting system across a large metropolitan area. The proposed decision model aims to maximise energy consumption reduction while also achieving an optimal allocation of retrofit actions among street lighting subsystems, all while making efficient use of the available budget. A quadratic knapsack problem is used to express the resulting optimization problem.

B. MODELLING AND SIMULATION OF MECHANICAL SYSTEM FOR POWER GENERATION USING FOOTSTEPS

The development of several green (clean) energy system is a major strategy to achieve environment balance . We know that most people spend most of their lifetime in walking. During walking, human feet exert force on

the ground, and this force can be used to generate electrical energy with the help of footstep power generator .Several types of footstep power generations methods are available, and majority of these devices use piezoelectric transducer to generate power. Major problem in designing with piezoelectric transducer is the selection of suitable ferroelectric material because it governs the efficiency of energy conversion, i.e., from kinetic to electrical energy .In this paper, we are talking about a proposal toward a newer thought of generating electricity, by taking the human footsteps as the primary source of the supply of fuel. The growing population leaves a larger footfall which rejects the energy down toward the earth, and this not so large energy yet can be utilized in a way through the system designed and connected in order to harness the footfall's exerted force.

C. FOOTSTEP POWER GENERATION USING PIEZOELECTRIC MATERIALS [2021 IEEE INTERNATIONAL CONFERENCE ON CSITSS]

This paper represents a technique for gathering this human headway energy with the utilization of piezoelectric sensor and shows an application with the put away energy for example to charge a cell phone safely and also used to glow an LED based on the motion using the passive infrared sensor.

D. INTERNATIONAL JOURNAL OF ENGINEERING AND COMPUTER SCIENCE:FOOTSTEP POWER GENERATION SYSTEM

The paper portrays consequently footsteps energy carries on exploited and it draws upon non-conventional sources of energy resources. It defines having advantages of the global warming and load shedding in best way of cleaner the cost-effective way.

E. FOOTSTEP POWER GENERATION USING PIEZO ELECTRIC PLATE

The proposal for utilising waste energy from human movement to generate electricity is particularly relevant and significant for densely populated nations such as India and China, where the mobility of their people will prove to be a godsend in producing electricity from their footfall. Roads, train stations, and bus stops are all overcrowded in India, and thousands of public travel in an hour. As a result, this promising technology may be used to generate a vast amount of power. Also, the utilization of such technology shifts the civilization toward renewable energy from the non-renewables like coal, petroleum, and natural gas. People's weight provides power when they walk on the rungs or platform. A piezoelectric sensor transfers mechanical energy delivered through glass into electrical power as part of the control mechanism. Finally, this concept presents an appealing method to obtain clean, renewable power and is also very user-friendly.

III. METHODOLOGY

To create an advanced step-power generation system that utilizes RFID for charging, we created a design and construction plan .The power of a person's footstep affects the voltage the piezoelectric sensor produces. The output of the piezoelectric sensor shows 0 V when no force is applied. It has been shown that the voltage produced rises along with the pressure applied. High-pressure results in strong voltage generation. A mobile phone can be used as the output to show that the rechargeable battery that the piezoelectric sensor has charged is operating properly and that the electric current produced by the sensor is present.

KEY COMPONENETS

1. ATMEGA 328 MICROCONTROLLER
2. PIEZO ELECTRIC CRYSTALS
3. VOLTAGE REGULATOR
4. BATTERY
5. DC LOAD
6. LCD DISPLAY
7. RFID
8. USB PORT

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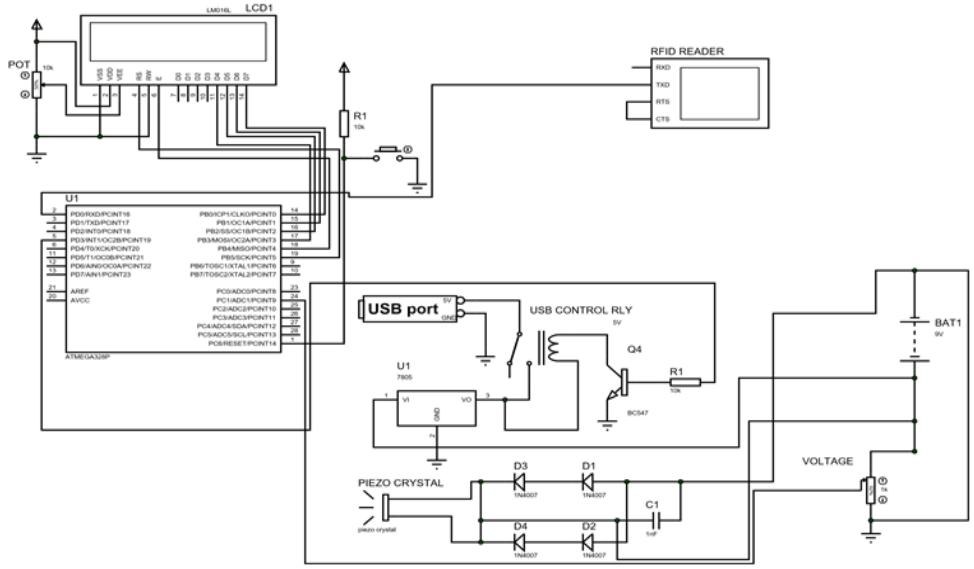
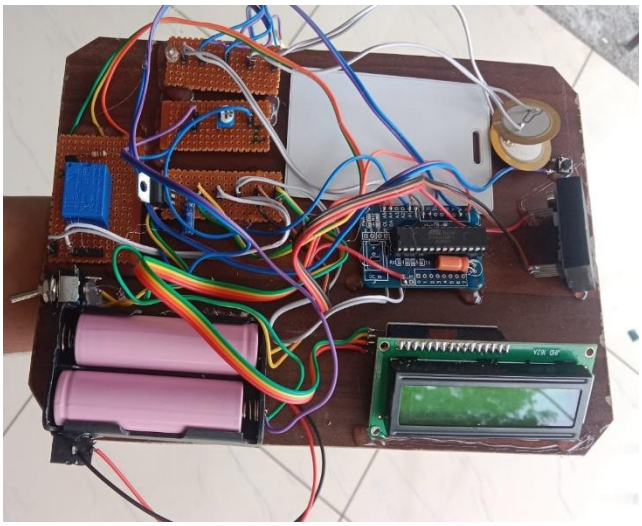
CIRCUIT DIAGRAM



WORKING

When we apply a pressure on the piezo electric crystals it will generate a momentary voltage . This voltage is read through the analog pins of Atmega328 microcontroller . This voltage is then stored in the rechargeable battery .The diodes allow the electricity to flow in one direction . They help to ensure that the current flows into the voltage regulator and not back out. Capacitor stores the electrical energy and helps to smooth out the output voltage from the voltage regulator . Pot or the variable resistor allows to adjust the output voltage . USB Port allows to connect the mobile phone for charging . The Control Relay likely controls the connection between the battery and the USB port . It acts as a switch for charging. The amount of power generated will vary depending on the weight and walking style of the person.

IV. WORKING MODEL



V. CONCLUSION

In conclusion, the development of a human foot stress energy harvesting system utilizing piezoelectric sensors for mobile generation presents promising opportunities for renewable energy integration. Through harnessing the mechanical energy generated by human footsteps, this system can contribute to sustainable power generation, particularly in urban environments with high pedestrian traffic. However, further research is needed to optimize the efficiency, durability, and scalability of such systems to maximize their practical

applications and impact in real-world settings. Additionally, exploring innovative design approaches and materials could enhance the overall performance and viability of foot stress energy harvesting systems for widespread adoption in the future

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