FOOTSTEP POWER GENERATION PROJECT USING ARDUINO

Project Reference No.: *48S_BE_6207*

College : Poojya Doddappa Appa College Of Engineering, Kalaburagi
Branch : Department Of Electronics And Communication
Guide : Prof. Shantling Patil
Student(S): Ms. Rakshita
Ms. Preeti Sutar
Ms. Shreelata S Biradar
Ms. Zeba Sultana

Keywords:

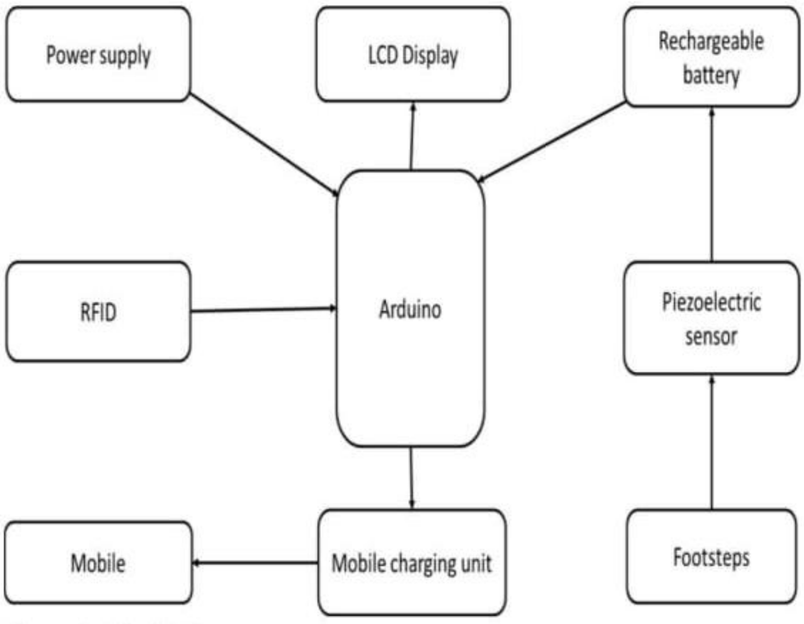
Footstep Power, Human Kinetic Energy, Piezoelectric Sensor, Energy Harvesting, Renewable Energy, Human Motion, Power Generation,Green Energy, Smart Floor, Sustainable Tech.

Introduction:

As the demand for renewable and sustainable energy sources increases, footstep power generation offers an innovative solution by converting human kinetic energy into electrical energy. This project implements a footstep power generation system using an Arduino microcontroller and piezoelectric sensors. When pressure is applied to the sensors through footsteps, they generate an AC voltage, which is rectified using a bridge rectifier and regulated using a voltage regulator circuit. The Arduino monitors voltage levels and can be integrated with an LCD or IoT module for real-time data display. The stored energy can be used to power low-voltage devices or charge batteries, making the system suitable for smart public infrastructure in high-footfall areas.

With the growing need for sustainable energy solutions, harvesting energy from everyday human activities has gained attention. Footstep power generation is a method of converting the kinetic energy from walking into electrical energy. This project focuses on a footstep power generation system using Arduino, which utilizes piezoelectric sensors to capture energy from footsteps. The generated power can be stored and used for low-power applications, contributing to green energy initiatives.

This system is cost-effective, eco-friendly, and ideal for high-footfall areas like railway stations, malls, or sidewalks.



Block Diagram of Footstep Power Generation Project Using Arduino

Objectives:

The primary objective of this project is to design and implement an energy harvesting system that converts kinetic energy from human footsteps into electrical energy using piezoelectric sensors, and to monitor and manage this energy through an Arduino-based microcontroller. The project aims to explore sustainable and renewable energy solutions by utilizing everyday human movement, with the goal of powering small electronic devices or storing energy for future use, thus contributing to energy efficiency in public and crowded areas..

Methodology:

The footstep power generation project using Arduino involves generating electricity from footsteps with piezoelectric sensors. These sensors are installed on a platform to convert mechanical energy into electrical energy. The electrical output is passed through a rectifier to convert AC to DC, stored in a capacitor or battery, and regulated using a voltage regulator. Arduino is integrated to monitor the generated voltage, calculate power and energy, and optionally display the results on an LCD. The system is assembled, programmed, and tested for accuracy under different pressure conditions. Finally, it is deployed in high-traffic areas for efficient energy harvesting and optimized for better performance. Finally, the system is tested by simulating foot traffic over the platform. The energy stored can be used to power low-energy devices such as LEDs or small electronics, demonstrating its practical application. This methodology ensures a simple, efficient, and sustainable solution for energy generation, particularly in areas with high pedestrian traffic.

Result and Conclusion:

A footstep power generation system using Arduino converts mechanical energy from footsteps into electrical energy using pressure-sensitive devices like piezoelectric sensors. The system typically produces 5-12V and low current in the milliampere range. Arduino processes sensor data, displaying real-time energy output on an LCD or transmitting it for analysis. The generated power is stored in rechargeable batteries or capacitors for later use, with LEDs indicating charging status. It can power small devices like LEDs, showcasing renewable energy potential in high-footfall areas. Durable and efficient, the system demonstrates innovative energy harvesting and promotes sustainable energy solutions. Overall, the expected output demonstrates the potential for renewable energy solutions through human activity. This project highlights the practicality of sustainable energy generation and serves as an educational and awareness-raising tool for renewable energy technologies. It showcases the possibility of integrating such systems into urban environments to support low-power applications while promoting sustainability and energy conservation.

In conclusion:

The expected outcomes of the footstep power generation system using Arduino converts mechanical energy from footsteps into electrical energy using pressure-sensitive devices like piezoelectric sensors. The system typically produces 5–12V and low current in the milliampere range. Arduino processes sensor data, displaying real-time energy output on an LCD or transmitting it for analysis. The generated power is stored in rechargeable batteries or capacitors for later use, with LEDs indicating charging status. It can power small devices like LEDs, showcasing renewable energy potential in high-footfall areas. Durable and efficient, the system demonstrates innovative energy harvesting and promotes sustainable energy solutions.

Future Scope:

The footstep power generation system shows promise but can be improved further.

1. Use of advanced piezoelectric materials for higher energy output.
2. Integration with supercapacitors for efficient energy storage.
3. Development of compact and durable modules for outdoor use.
4. Connecting multiple tiles in series for greater power generation.
5. Implementation of wireless data transmission using IoT modules.
6. Real-time monitoring through mobile apps or cloud platforms.
7. Integration with smart street lighting systems.
8. Use in high footfall areas like malls, stations, and schools.
9. Design enhancements for better energy transfer efficiency.
10. Combining piezoelectric with solar for hybrid energy harvesting.
11. Addition of user feedback displays to show power generated.
12. Enhanced circuit design for minimal energy loss.