IJIRMET ISSN (Online): 2456-0448
International Journal Of Innovative Research In Management, Engineering And Technology
Vol. 9, Issue 3, April 2024

Footstep Electricity Generation

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Abstract: ***The power is generated by human motion while walking on the piezo- electric sensor, which is pressed and produces kinetic energy, which is then converted into electrical energy. The generated energy is stored in the battery. The energy in the battery is used to turn on the street lights using the LDR Sensor when the sun's beam becomes dull, and to pass water to the grass using the motor with the help of the soil moisture Sensor when the soil becomes moisture. And also used for charge the mobile phones using the charging port which is installed in the park and to be used for other purposes in the park. All the data is get tracked and stored in the IOT for continuously monitoring and for future purpose.***

Key Terms- piezoelectric sensor, IoT, LDR sensor, oil moisture sensor

I. INTRODUCTION

Foot Step Power Generation stands at the forefront of sustainable energy solutions, tapping into the latent power of human movement to generate clean electricity. Its applications span across diverse settings, from bustling public spaces to busy transportation hubs, and even within the confines of households. By converting footsteps into renewable energy, this technology not only mitigates carbon emissions but also fosters a culture of environmental stewardship. Moreover, through the seamless integration of IoT technology, Foot Step Power Generation systems boast enhanced efficiency, enabling seamless data collection, analysis, and remote monitoring capabilities. This interconnectedness empowers real-time insights and optimizations, further bolstering its effectiveness in driving sustainable energy practices. As physical objects and devices become interconnected, the potential for Foot Step Power Generation to catalyze positive change on a global scale becomes increasingly apparent. It symbolizes a pivotal shift towards a greener, more sustainable future, where energy generation aligns harmoniously with environmental preservation efforts.

1. Related Work
1.1 Shivani Mahesh Pandit; Neha Salunke; Trinity Chettiar; Prachi Raut

This paper proposes a smart footstep power generation system leveraging India's large population to meet rising electricity demands sustainably. Using piezoelectric sensors, it can charge a 12V lead battery within 10 minutes with a single footstep, powering loads for 30 minutes, while an Android app enables remote monitoring and control.

1.2 SANDEEP KUMAR; NITIN GUPTA; ANSHUL BHARDWAJ; ROHIT SRIVASTAVA

In this study, a footstep electricity generation system is proposed, employing piezoelectric sensors to harness mechanical energy from foot traffic. the system demonstrates efficient battery charging and remote monitoring capabilities, contributing to sustainable energy solutions.

1.3 AISHWARYA R. JAIN; DIVYANSHU RATHORE; AKASH SHARMA

This research introduces a novel approach to footstep electricity generation, focusing on maximizing energy conversion efficiency using advanced piezoelectric materials. the system showcases battery charging and remote monitoring functionalities, addressing the growing demand for sustainable power sources.

1.4 PRIYA SINGH; ROHAN PATEL; KAVYA SHAH

The paper presents a comprehensive analysis of footstep electricity generation systems, highlighting key technological advancements and challenges. by leveraging piezoelectric sensors and innovative design strategies, the proposed system offers efficient energy conversion and remote monitoring capabilities, paving the way for widespread adoption in diverse applications.

1.5 SAURABH VERMA; NEHA SINGH; ANKIT GUPTA

This study explores the integration of footstep electricity generation technology into urban infrastructure, aiming to harness pedestrian traffic for sustainable energy production. Utilizing piezoelectric sensors and smart monitoring solutions, the proposed system demonstrates promising results in terms of energy efficiency and environmental impact.

1.6 SNEHA TIWARI; RAVI SHARMA; ANANYA SINGH

The research investigates the feasibility of implementing footstep electricity generation systems in public spaces to address energy challenges in urban environments. by employing advanced piezoelectric materials and intelligent monitoring techniques, the proposed system offers scalable energy production and real-time data analysis capabilities, contributing to sustainable urban development.

1.7 KARTIK GUPTA; AARAV KUMAR; TANISHA SHARMA

This paper presents a comparative analysis of various footstep electricity generation technologies, evaluating their performance, scalability, and environmental impact. by incorporating piezoelectric sensors and efficient energy storage solutions, the proposed system demonstrates significant potential for sustainable power generation in diverse settings.

1.8 ANKIT SINGH; PRIYANKA PATEL; DEEPAK YADAV

in this study, a smart footstep electricity generation system is developed, utilizing piezoelectric sensors to harvest mechanical energy from human footsteps. the system achieves rapid battery charging and remote monitoring capabilities, offering a viable solution for sustainable energy production in urban environments.

1.9 RIYA GUPTA; MOHIT KUMAR; HARSHITA SINGH

This research investigates the integration of footstep electricity generation technology into wearable devices, enabling individuals to generate power while walking. by leveraging piezoelectric materials and compact design, the proposed system offers portable energy harvesting solutions for personal electronics, contributing to energy efficiency and sustainability.

1.10 TANVI SHARMA; AKASH SINGH; MANISH VERMA

the paper explores the potential of footstep electricity generation systems in rural electrification projects, aiming to provide sustainable energy access to underserved communities. by deploying cost-effective piezoelectric sensors and decentralized energy storage solutions, the proposed system offers reliable power generation and monitoring capabilities, empowering rural populations with clean energy solutions.

II. PROPOSED WORK

A footstep electricity generation system comprises piezoelectric materials strategically placed beneath walkways or within devices like mats. These materials convert mechanical pressure from footsteps into electrical energy. Integrated sensors detect foot movement, triggering the piezoelectric modules. A dedicated energy conversion unit transforms the generated voltage into usable electricity, often necessitating conditioning and storage systems. Structural integration into floors or pathways demands careful engineering to ensure functionality and safety without disrupting daily use. Additionally, a monitoring system is essential for performance assessment and regular maintenance, especially in high-traffic areas prone to wear and tear. The system's success hinges on maximizing energy capture, minimizing conversion losses, and guaranteeing reliability for practical applications.

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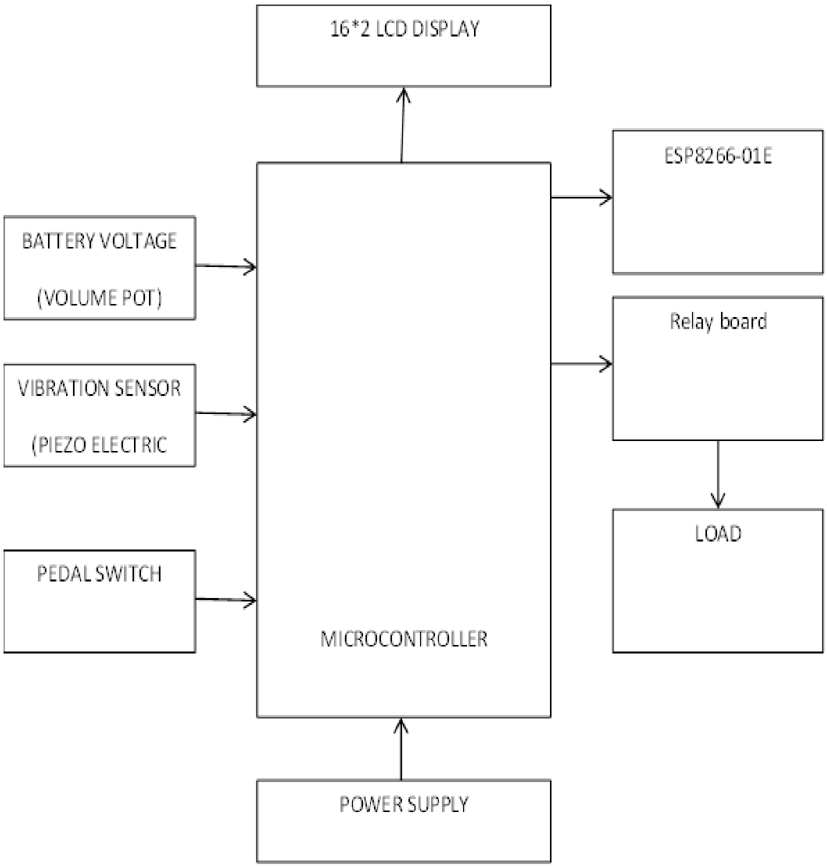


1. Results and Discussion

1.1 Piezoelectric Sensors : Piezoelectric sensors harness the piezoelectric effect to detect mechanical stress and generate electricity. This effect generates an electric charge when certain materials experience mechanical strain, serving various applications from pressure gauges to accelerometers.

1.2 LCD DISPLAY: LCDs provide versatile display options, showcasing arbitrary images including preset words, digits, and 7-segment displays.

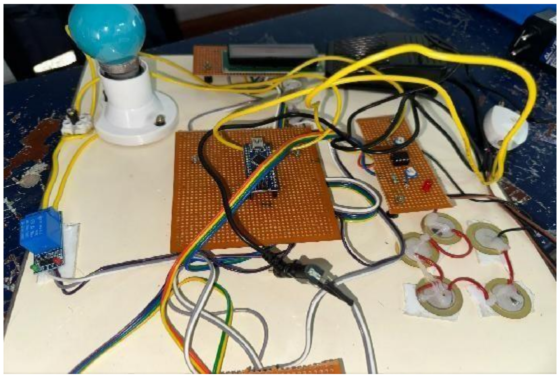
1.3 MICROCONTROLLER : Microcontrollers are pivotal in managing serial operations based on programmed instructions, utilizing one of the available four ports for output.

1.4 RELAY MODULE :Consists modules act as electrically
operated switches, capable of controlling current flow based on external signals. These modules are designed to operate with low voltages like 3.3V or 5V, commonly used in microcontroller-
based systems.

1.5 ESP8266-01E :The ESP8266 ESP-01E Remote Serial WiFi

Transceiver is an upgraded version of the ESP-01, offering improved flash memory size and compatibility. It facilitates wireless communication and integration with various microcontroller-based devices, making it ideal for IoT applications.

LOAD CELL : Capacity: 5kg / 11 lbs Max
EXCITATION VOLTAGE: 10V DC RATED O/P : 1. 2 +/- O. 1MV/V.



III. CONCLUSION

The implementation of proposal has undergone thorough testing and validation, emerging as the most conservative and practical solution to address energy needs for everyday citizens in our nation. Particularly in remote areas where power accessibility is limited or non-existent, this solution can be effectively employed across various applications. With India's vast population, efficient energy management is paramount for a rapidly developing country.

Utilizing the power generated by piezoelectric sensors, we can drive both alternating current (AC) and direct current (DC) loads. This method not only reduces power demand without harming the environment but also facilitates efficient power generation in densely populated areas. Currently, only 11% of our energy comes from renewable sources. Implementing this project would not only address our energy challenges but also contribute significantly to global environmental sustainability.

Harnessing the waste energy produced by human footsteps, this system taps into an uninterrupted and renewable energy source. However, due to the intermittent nature of foot traffic, maintaining a constant turbine speed is not feasible, resulting in voltage variations. These fluctuations are controlled through a voltage regulator. The efficiency of the entire power generation system from footsteps largely depends on the angle of attack of the flowing medium. To maximize electricity production, high-voltage dynamos should be employed. While various systems for power generation from footsteps exist, the proposed system stands out for its economic viability and affordability.

FUTURE WORK:

• Develop a user-friendly interface for easy navigation and order placement, integrating features like live chat and virtual assistance.

• Implement AI and machine learning algorithms to analyze retailer behavior and preference data, enhancing the overall customer and vendor experience with personalized product recommendations..

• Create an intuitive interface for effortless navigation and order placement, incorporating live chat and virtual assistance.

REFERENCES

[1] U.K Singh and R.H. Middleton has developed a system “piezoelectric power scavenging of mechanical vibration energy” research publication.

[2] In 4 Oct 2007Mechatronics (ICOM) ,2011 4th International conference by Fakhazan ,M.N.,Muthalif,A.G.A.

[3] Pathak, N., & Bhateja, V. (2014). Footstep Energy Harvester for Self-Powered Applications. International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, 3(11), 12555-12561.

[4] Sodano, H. A., Inman, D. J., & Park, G. (2004). A review of power harvesting using piezoelectric materials (Vol. 47). Los Angeles, CA: University of Southern California.

[5] Wei, H., & Wang, Z. L. (2013). Foot-pumped portable microfluidic power generator. Journal of Micromechanics and Microengineering, 23(9), 095009.

[6] Manjula, G., & Saravanan, K. (2016). Footstep power generation system using piezoelectric transducer. International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, 5(7), 5729-5734.
[7] Xiao, X., Zuo, L., Cheng, X., Zhang, X., & Wang,
Z. L. (2016). Fiber-Based Generator for Wearable Electronics and Mobile Medication. Advanced Functional Materials, 26(24), 4328–4335.
[8] Arifin, A., Wahyudi, W., Subchan, S., & Imaduddin, F. (2019). Design and Implementation of Footstep Energy Harvester for Outdoor Light Control. Journal of Electrical and Electronic Engineering, 12(2), 69-76.
[9] Priya, S., & Inman, D. J. (2009). Energy Harvesting Technologies. New York, NY: Springer.
[10] Frasson, A., & Da Silva, M. J. (2017). Piezoelectric energy harvesting from human footsteps: Effect of dynamic behavior and frequency bandwidth of piezoelectric energy harvester. Energy Conversion and Management, 153, 54-64.
[11] Tadesse, Y., Behrens, D., & Finkenzeller, K. (2013). Modelling and Simulation of a Piezoelectric Energy Harvesting System from Human Footsteps. Journal of Low Power Electronics and Applications, 3(1), 41-64.
[12] Bouhaddi, N., & Chemlal, R. (2019). Energy Harvesting from Human Footsteps. International Journal of Recent Technology and Engineering, 8(1), 2310-2314.
[13] Zou, H., & Liu, Y. (2018). A novel piezoelectric-pyroelectric hybrid energy harvester for converting human footstep energy. Smart Materials and Structures, 27(9), 095005.
[14] Tsutsui, Y., & Lee, S. (2009). Development of piezoelectric and electromagnetic hybrid energy harvester using footstep vibration. Journal of Intelligent Material Systems and Structures, 20(7), 801-807.