



Power Generation by Footstep

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Abstract: Nowadays, the requirement for power for various gadgets and instruments everywhere is increasing day by day. Over the past few years, many people have been using excessive amounts of energy, causing an energy crisis. This problem can be solved by increasing the number of gadgets, equipments using renewable energy. Walking is the most common human activity. When a person walks, they lose some energy. This wastage of energy can be used as renewable energy. “Power Generation By Footstep”, the aim of the project is to generate power by making use of piezoelectric and solar plates. This project includes how it utilizes the power generated by footsteps. The aim of this proposed system is to design a non-conventional method of power generation that will reduce the power shortage.

Keywords: Solar, Footstep, Sensors, Battery, Power Generation.

1. INTRODUCTION

Almost all essential items are products of electricity. So we made a system that not only generates energy from footsteps but also stores it so we can use it for various applications. For generating purposes, we are using piezoelectric materials have the ability to convert mechanical stress into energy. The power released by human locomotion is then transformed into an electric current by the piezoelectric device. On the other hand, by taking advantage of sunlight as an input to the solar panel, as sun is conventional source of energy, it helps in energy conservation and generation. After that, power is generated from the piezoelectric platform and solar panel, we need to preserve that energy, and for that purpose, a battery is used. Further that is supplied to PIR sensor which is connected to the bulb.

Literature Review

“Footstep Power Generation System” Mansi C. Meshram, Manjusha B. Mehar , Ankita V.



Koparkar , Shubham N. Suryawanshi , Prof. J. Shelke , Prof. S. Sahastrabudhey6 this paper introducing lost energy is transformed into electric energy using piezoelectric effect[1].” Footstep Power Generation Using Arduino Uno” by T. A. Tengku, and M. S Sbri. proposed system captures misused energy around system & transforms it into electric energy. Footsteps are used to apply force on designed sensor, which further gets converted to electric energy using Arduino [2].

“Electromagnetic Foot Step Power Generation” by Alla et. al focuses on strength which is then transformed to electric form. Design consists of coil made of copper & magnetic bar generating voltage. To store generated voltage battery is used. [3].

“Power Harvesting Using Piezoelectric Shoe for External Power Storage” by Mohmmad et. al focused-on circuit having piezoelectric sensor having storing capabilities. It compromises piezo disc, bridge rectifier, USB hawsers with exterior power loading device. [4]

Components Requirement

Hardware Requirement

- Piezoelectric Sensors

- Solar Panel

- Battery

- Charge Controller Circuit

- Diode

- Capacitor

- Relay

- Zero PCB

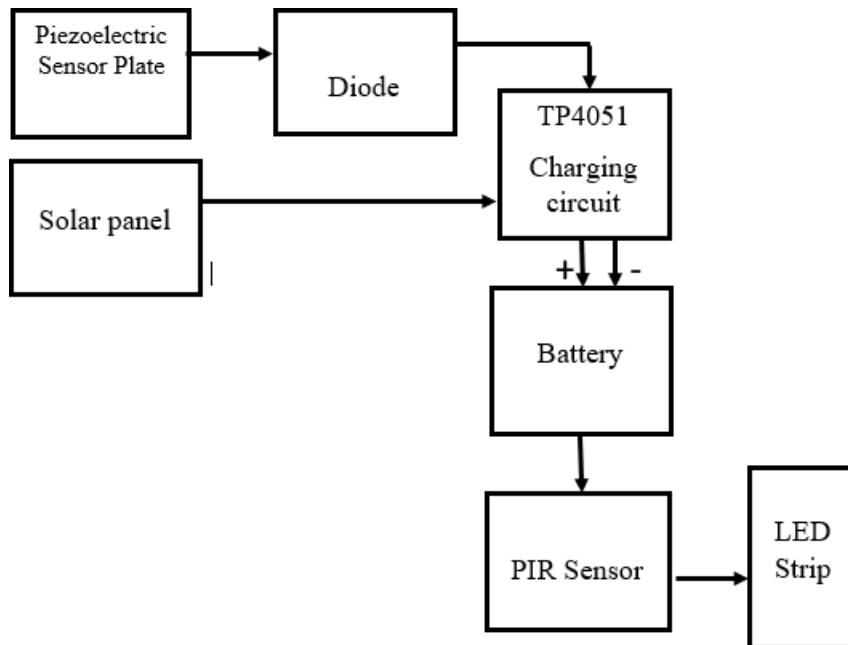
- Bulb

- LED

- PIR Sensor

- Connecting Wiress

Flowgraph



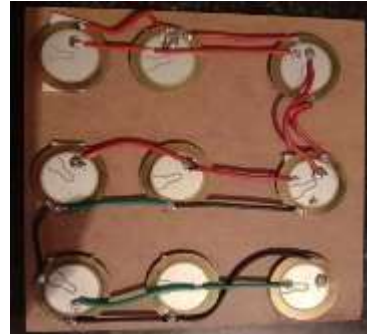
2. METHODOLOGY

This proposed system is based on Piezo effect. When the pressure is applied, the piezoelectric sensor has property to convert it into electrical energy. We made a plate of piezoelectric sensors and the sensors are connected in parallel manner. When we apply mechanical stress or energy it will convert it into electrical energy but that output was insufficient for our project, solution for this we connect a solar panel which is of 6v. The output of piezoelectric sensors is in pulsating ac form so we have to convert into dc form for this purpose we connect a bridge rectifier. Both of the outputs should not go in reverse direction, it must flow in unidirectional for this purpose we are using two diodes named as 1N4007. For storing purpose, we are using Lithium Ion battery which is of 2200mAh 3.7v. The output terminal of battery is connected to the load. We are using 10watt bulb as a load. Whenever the battery will fully charge the bulb will turn on but if there is no one in the room or that particular area this will be a wastage of stored electricity. Solution for this we placed a PIR sensor between the battery and the load. Now what will happen, whenever any person or any object enters in that room or that particular area the PIR sensor will detect the movement of that person or object and sends signal to the load i.e. bulb. After detecting the movement, the bulb, it will be turned on for next 40 seconds and after that it will get turned off automatically.

Steps of making hardware



(a) Piezoelectric sensors placed in parallel manner

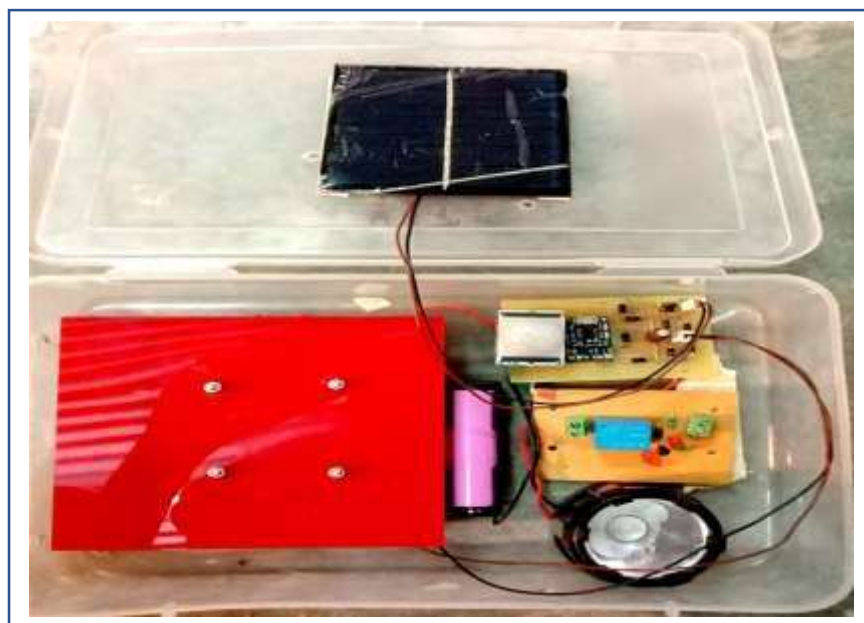


(b) Parallel connection of sensors



(c) Placed springs on sensors for when applying pressure the same pressure should be applied on each sensor

Final Model of Project



Hardware Implementation



3. RESULTS

The existence of electricity produced by both the components first is piezoelectric sensor and solar panel can be proved by bulb, which plays the role of load in our project. It shows that the lithium Ion Battery which has been charged by piezoelectric sensor and solar panel is well functioning shown in fig. 2. The operation of system is checked by voltage obtained at output terminals of piezoelectric sensor and solar panel. We get 17v at output terminal of sensors and 5.2 at output terminal of solar panel. After movement detected by PIR sensor the bulb will turn on for 40 seconds.

4. CONCLUSIONS

This project develops novel method to generate electric energy with minimum cost, utilizing the consumption of footsteps power for generating electrical energy. It doesn't include only generation but also storage of energy generated. Idea can be implemented for various applications where energy is wasted due to unavailability of objects or persons using light.

5. REFERENCES

1. Mohammad Saffri Mazalan, Rosline Mohamad, Murizah Kassim, Shahrani Shhbudin. "Power Harvesting Using Piezoelectric Shoe For External Power Storage", Indonesian Journal of electrical Engineering and Computer Science Vol. 9, No. 3, March, pp. 655 ~ 659 ISSN:2502-4752, DOI: 10.11591/ijecs.v9.i3.pp655-659
2. Tengku Azita Tengku Aziz, and Muhammad Syamir Subri. "Footstep power generation using Arduino uno" Cite as: AIP Conference Proceeding 2129, 020097(2019); <https://doi.org/10.1063/1.5118105>. Published Online: 30 July 2019
3. Mansi C. Meshram, Manjusha B, Mehar, Ankita V. Koparkar, Shubham N. suryawanshi, Prof. J. Shelke⁵, Prof. S. Sahastrabudhry⁶ "FOOTSTEP POWER GENERATION SYSTEM" IJARIE-ISSN(O)-2395-4396, Vol-5 Issue-2-2019
4. Alla Chandra Selhar, B Murali Kishore, T Jogi Raju³. "Electromagnetic Foot Stem Power Generation". International Journal of Scientific and Research Publications, Volume 4, Issue 6, June 2014. ISSN 2250-3153
5. Shubha Kumar, Sharad Mittal, Sachine Saini, Vishnu Pal. "Foot Step Conservation System". International Journal of Scientific & Engineering Research Volume7, Issue 5, May-2016. ISSN 2229-5518.
6. Akshay G Masa, Shital P Mundlik, Rutuparna R Lawand, & Ganesh B Birajadar. (2022). "Smart Parking Management System" (Based on IOT Modules). Journal of Electronics, Computer Networking and Applied Mathematics (JECNAM) ISSN : 2799-1156, 2(06), 8–12. <https://doi.org/10.55529/jecnam.26.8.12>
7. Mulani, Altaf O., and P. B. Mane. "Watermarking and cryptography based image authentication on reconfigurable platform." Bulletin of Electrical Engineering and Informatics 6.2 (2017): 181-187.
8. H. S. Deshpande, K. J. Karande and A. O. Mulani, "Efficient implementation of AES algorithm on FPGA," 2014 International Conference on Communication and Signal



- Processing, Melmaruvathur, India, 2014, pp. 1895-1899, doi: 10.1109/ICCSP.2014.6950174.
9. Swami, Shweta S., and Altaf O. Mulani. "An efficient FPGA implementation of discrete wavelet transform for image compression." 2017 International Conference on Energy, Communication, Data Analytics and Soft Computing (ICECDS). IEEE, 2017.
 10. Kulkarni, Priyanka R., Altaaf O. Mulani, and P. B. Mane. "Robust invisible watermarking for image authentication." Emerging Trends in Electrical, Communications and Information Technologies: Proceedings of ICECIT-2015. Springer Singapore, 2017.
 11. Nagane, U. P., and A. O. Mulani. "Moving object detection and tracking using Matlab." Journal of Science and Technology 6 (2021): 86-89.
 12. Jadhav, Makrand M. "Machine learning based autonomous fire combat turret." Turkish Journal of Computer and Mathematics Education (TURCOMAT) 12.2 (2021): 2372-2381.
 13. Mulani, A. O., and G. N. Shinde. "An approach for robust digital image watermarking using DWT-PCA." Journal of Science and Technology 6.1 (2021).
 14. Mulani, Altaf O., and P. B. Mane. "Area efficient high speed FPGA based invisible watermarking for image authentication." Indian journal of Science and Technology 9.39 (2016): 0974-564.
 15. Kalyankar, Pratima Amol, et al. "Scalable face image retrieval using AES technique." Journal Of Algebraic Statistics 13.3 (2022): 173-176.
 16. Mulani, Altaf O., and Dr PB Mane. "An Efficient implementation of DWT for image compression on reconfigurable platform." International Journal of Control Theory and Applications 10.15 (2017): 1-7.
 17. Shinde, Ganesh, and Altaaf Mulani. "A robust digital image watermarking using DWT-PCA." International Journal of Innovations in Engineering Research and Technology 6.4 (2019): 1-7.
 18. Mulani, Altaf O., and P. Mane. "Secure and area efficient implementation of digital image watermarking on reconfigurable platform." Int. J. Innov. Technol. Explor. Eng.(IJITEE) 8.2 (2018): 1.
 19. Mandwale, Amruta J., and Altaf O. Mulani. "Different Approaches For Implementation of Viterbi decoder on reconfigurable platform." 2015 International Conference on Pervasive Computing (ICPC). IEEE, 2015.
 20. Mane, P. B., and A. O. Mulani. "High speed area efficient FPGA implementation of AES algorithm." International Journal of Reconfigurable and Embedded Systems 7.3 (2018): 157-165.
 21. Ghodake, Mr Rahul Ganpat, and Mr AO Mulani. "Sensor based automatic drip irrigation system." Journal for Research 2.02 (2016).
 22. Deshpande, Hrushikesh S., Kailash J. Karande, and Altaaf O. Mulani. "Area optimized implementation of AES algorithm on FPGA." 2015 International Conference on Communications and Signal Processing (ICCSP). IEEE, 2015.
 23. Mane, Dr PB, and A. O. Mulani. "High throughput and area efficient FPGA implementation of AES algorithm." International Journal of Engineering and Advanced Technology 8.4 (2019).
 24. Pol, Rahul S., et al. "iButton Based Physical access Authorization and security



- system." *Journal of Algebraic Statistics* 13.3 (2022): 3822-3829.
25. Kulkarni, Priyanka, and Altaaf O. Mulani. "Robust invisible digital image watermarking using discrete wavelet transform." *International Journal of Engineering Research & Technology (IJERT)* 4.01 (2015): 139-141.
 26. Mulani, Altaf O., and P. B. Mane. "Area optimization of cryptographic algorithm on less dense reconfigurable platform." 2014 International Conference on Smart Structures and Systems (ICSSS). IEEE, 2014.
 27. Kashid, M. M., K. J. Karande, and A. O. Mulani. "IoT-Based Environmental Parameter Monitoring Using Machine Learning Approach." *Proceedings of the International Conference on Cognitive and Intelligent Computing: ICCIC 2021, Volume 1*. Singapore: Springer Nature Singapore, 2022.
 28. Liyakat, Kazi Kutubuddin Sayyad, et al. "Yarn Quality detection for Textile Industries using Image Processing." *Journal Of Algebraic Statistics* 13.3 (2022): 3465-3472.
 29. Godse, A. P., and A. O. Mulani. *Embedded systems*. Technical Publications, 2009.
 30. Mulani, Altaf O., and Pradeep B. Mane. "High-Speed area-efficient implementation of AES algorithm on reconfigurable platform." *Computer and Network Security* 119 (2019).
 31. Jadhav, Hemlata M., Altaf Mulani, and Makarand M. Jadhav. "Design and Development of Chatbot Based on Reinforcement Learning." *Machine Learning Algorithms for Signal and Image Processing* (2022): 219-229.
 32. Kondekar, Renuka P., and A. O. Mulani. "Raspberry Pi based voice operated Robot." *International Journal of Recent Engineering Research and Development* 2.12 (2017): 69-76.
 33. Mulani, A. O., M. M. Jadhav, and Mahesh Seth. "Painless Non-invasive blood glucose concentration level estimation using PCA and machine learning." *the CRC Book entitled Artificial Intelligence, Internet of Things(IoT) and Smart Materials for Energy Applications* (2022).
 34. Kamble, Akshata, and A. O. Mulani. "Google Assistant based Device Control." *Int. J. of Aquatic Science* 13.1 (2022): 550-555.
 35. Ghodake, Rahul G., and Altaf O. Mulani. "Microcontroller Based Automatic Drip Irrigation System." *Techno-Societal 2016: Proceedings of the International Conference on Advanced Technologies for Societal Applications*. Springer International Publishing, 2018.
 36. Mandwale, Amruta, and Altaf O. Mulani. "Implementation of High Speed Viterbi Decoder using FPGA." *International Journal of Engineering Research & Technology(IJERT)* (2016).
 37. Mandwale, Amruta, and A. O. Mulani. "Implementation of Convolutional Encoder & Different Approaches for Viterbi Decoder." *IEEE International Conference on Communications, Signal Processing Computing and Information technologies*. 2014.
 38. Basanti, K. "Fast and Efficient VLSI Implementation of DWT for Image Compression." *Turkish Journal of Computer and Mathematics Education (TURCOMAT)* 12.13 (2021): 3509-3514.
 39. Kalyankar, Pratima Amol, et al. "Scalable face image retrieval using AESC technique." *Journal of Algebraic Statistics* 13.3 (2022): 173-176.
 40. Pathan, Atik N., et al. "Hand Gesture Controlled Robotic System." *Int. J. of Aquatic*



- Science 13.1 (2022): 487-493.
41. Kolekar, Supriya D., et al. "Password Based Door Lock System." *Int. J. of Aquatic Science* 13.1 (2022): 494-501.
 42. Korake, D. M., and A. O. Mulani. "Design of Computer/Laptop Independent Data transfer system from one USB flash drive to another using ARM11 processorl." *International Journal of Science, Engineering and Technology Research* (2016).
 43. Utpat, V. B., Dr KJ Karande, and Dr AO Mulani. "Grading of Pomegranate Using Quality Analysisl." *International Journal for Research in Applied Science & Engineering Technology (IJRASET)* 10.
 44. Patale, Jayshri Prakash, et al. "A Systematic survey on Estimation of Electrical Vehicle." *Journal of Electronics, Computer Networking and Applied Mathematics (JECNAM)* ISSN: 2799-1156 3.01 (2023): 1-6.
 45. Mulani, Altaf O., Makarand M. Jadhav, and Mahesh Seth. "Painless Machine Learning Approach to Estimate Blood Glucose Level with Non-Invasive Devices." *Artificial Intelligence, Internet of Things (IoT) and Smart Materials for Energy Applications*. CRC Press, 2022. 83-100.
 46. Rahul, G. Ghodake, and A. O. Mulani. "Microcontroller Based Drip Irrigation System." (2016): 109-115.
 47. Patale, Jayshri Prakash, et al. "Python Algorithm to Estimate Range of Electrical Vehicle." *Telematique* (2022): 7046-7059.
 48. Takale, Swapnil, and Altaaf Mulani. "DWT-PCA based Video Watermarking." *Journal of Electronics, Computer Networking and Applied Mathematics (JECNAM)* ISSN: 2799-1156 2.06 (2022): 1-7.
 49. Shinde, Rahul, and A. O. Mulani. "Analysis of Biomedical Imagel." *International Journal on Recent & Innovative trend in technology (IJRITT)* (2015).
 50. Mandwale, Amruta, and A. O. Mulani. "Different Approaches For Implementation of Viterbi decoder." *IEEE International Conference on Pervasive Computing (ICPC)*. 2015.
 51. Takale, Swapnil, and Altaaf Mulani. "Video Watermarking System." *International Journal for Research in Applied Science & Engineering Technology (IJRASET)* 10.
 52. Maske, Yogita, et al. "Development of BIOBOT System to Assist COVID Patient and Caretakers." *European Journal of Molecular & Clinical Medicine* 10.01 (2023): 2023.
 53. Gadade, Bhanudas, and Altaf Mulani. "Automatic System for Car Health Monitoring." *International Journal of Innovations in Engineering Research and Technology* (2022): 57-62.
 54. Yogita Maske, Mr. A. B. Jagadale, Dr. Altaf O. Mulani, and Mrs. A. C. Pise. "Implementation of BIOBOT System for COVID Patient and Caretakers Assistant Using IOT". *International Journal of Information Technology & Computer Engineering (IJITC)* ISSN : 2455-5290, vol. 2, no. 01, Jan. 2023, pp. 30-43, doi:10.55529/ijitc.21.30.43.
 55. Godse, A. P., A. O mulani (2009)." *Embedded Systems (First Edition)*. pp.(1-5).
 56. Mahesh Seth, A O Mulani, M Jadhav, "Painless Machine learning approach to estimate blood glucose level of Non-Invasive device", *Artificial Intelligence, Internet of Things (IoT) and Smart Materials for Energy Applications*, 2022



57. A. O. Mulani, P. B. Mane, “High speed area efficient FPGA implementation of AES algorithm”, International Journal of Reconfigurable and Embedded Systems (IJRES), Vol 7, Is. 3, 157-165
58. AO (Altaf) Mulani. Watermarking and Cryptography Based Image Authentication on Reconfigurable Platform. Universitas Ahmad Dahlan, 2017.
59. Akshata Kambale. A. O. Mulani, “HOME AUTOMATION USING GOOGLE ASSISTANT”, UGC care approved journal, Vol 32 Issue 1, 2023
60. A. O. Mulani, Dr. K. S. L. Kazi, “Effect of Rotation and Projection on Real Time Hand Gesture Recognition System for Human Computer Interaction”, Journal of Gujrat Research Society, Volume 21 Issue 16, Dec 2019.
61. A. O. Mulani, R. A. Sawant, “Automatic PCB Track Design Machine”, International Journal of Innovative Science and Research Technology, Vol 7, Issue 9, Sept 22.
62. Rutuja Abhangaro, A. O. Mulani, “DESIGN AND IMPLEMENTATION OF 8-BIT VEDIC MULTIPLIER”, International Journal of Research Publications in Engineering and Technology (ISSN No: 2454-7875), March 2017.