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FOOTSTEP POWER GENERATION PLATFORM WITH PIEZOELECTRIC AND FLOORING MECHANISM

T. Chandrasekar[1], A. Abdul Aziz[2], P. Dhinesh Kumar[3], S. Abdul Wahith[4]

Associate professor, Electrical and Electronics Engineering, Velammal College of Engineering and Technology, Viraganoor, Madurai, Tamil Nadu[1]

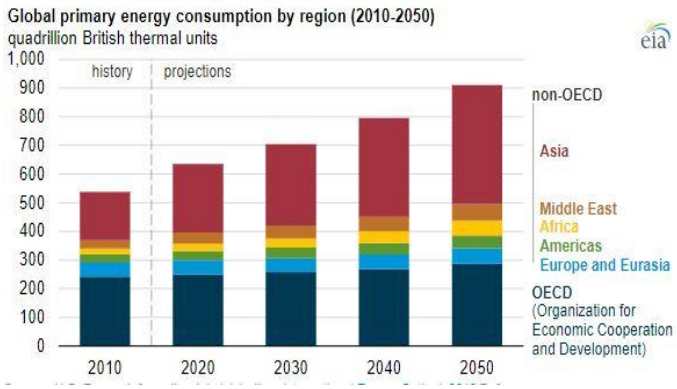
Student, Electrical and Electronics Engineering, Velammal College of Engineering and Technology, Viraganoor, Madurai, Tamil Nadu[2,3,4]

Abstract: The power crisis is to be one of the serious topics to be discussed. There is a possible solution for this to provide Sufficient amount of power using renewable energy. Among these resources, the human population is the only far away and Weather resource that has not been utilized. By using the proper method required amount of power can be obtained from this resource. We have found the idea to utilize human walking power to generate electricity and we have designed a method named footstep power generation platform when people walk on the platform, electricity will be generated in this system uses the pressure due to weight of the person walking on the platform and stored using batteries. It can be installed on sidewalks, parks and jogging tracks and many other public places like a railway junction, airport, etc. and thus we can meet the electricity demand to a greater extend.

Keywords: Electrical power, footstep power generation system, supply, and Demand.

INTRODUCTION:

Electricity is used in day-to-day life, industries, transportation, etc. Now to fulfill this increasing electricity demand, engineers are finding new ways to generate it. There are many places where there is no electricity .so we are generating electrical power utilizing renewable energy, by simply walking on the footstep. The usage of waste energy of foot power with human locomotion can be used for electricity generation is very much relevant and important. Here using footstep locomotion we are converting mechanical energy into electrical energy. It is clear, safe, and free, does not pollute the environment, and thus will be an extremely viable alternative in the days to come. As our population is increasing day by day the pedestrians are moving one after another continuously on the footpaths as well as in the cities, the footstep mechanism generates nonstop energy, which can be stored and utilized. The main objectives of this project are to generate electricity through the human foot and To store the electricity for further use and to produce electricity at the cheapest cost.



RELATED WORK:

A. Maximum energy harvesting from electromagnetic micro-generators by footsteps using photo sensor:

In the present scenario, energy and power play a major role in human life to meet their basic needs and necessities. A design methodology of electrical power generation using footsteps was presented for energy applications. Various energy resources have not been utilized in a useful manner. This will be more useful for highly populated countries like

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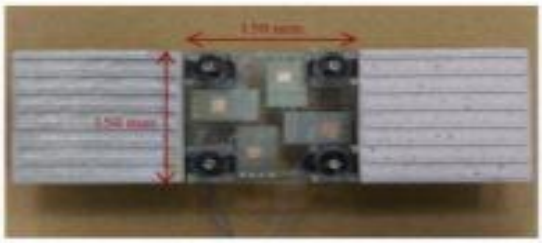
INDIA and CHINA, where the roads, railway stations, temples and bus stops are overcrowded and large number of people moving around the clock. By using such principle the energy can be utilized properly in the total area where the mechanical energy is being converted to electrical energy. The main motto of this project is to face the energy crisis somehow, which is the main issue in the world.

B. Manufacturing a tile for harvesting energy from footsteps:

The objective of this research is to design a piezoelectric tile for harvesting energy from footsteps and to optimize the system for harvesting maximum energy. we designed a tile that employs indirect energy transmission using springs and a tip mass. It aimed at matching the mechanical resonance frequency of the tile with that of the piezoelectric modules. The resonance frequency of a piezoelectric module with a 10-g tip mass was almost similar to the vibration frequency of the tile at 22.5 Hz when we dropped an 80-g steel ball from a 1-m height. It performed impedance matching and realized a matching value of 15 kΩ. Under these optimal mechanical and electrical conditions, harvested 770-μW RMS and 55-mW peak output power.



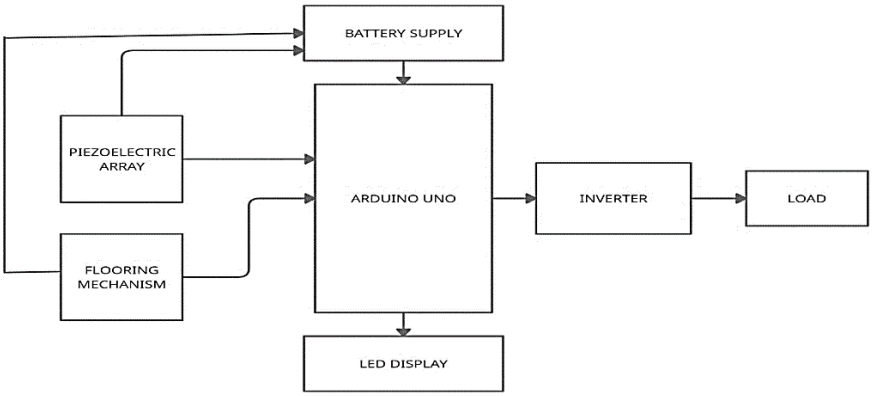
C. Novel multilevel inverter carrier-based PWM method:

The advent of the transformerless multilevel inverter topology has brought forth various pulse width modulation (PWM) schemes as a means to control the switching of the active devices in each of the multiple voltage levels in the inverter. How an existing multilevel carrier-based PWM affects switch utilization for the different levels of a diode-clamped inverter is conducted. Two novel carrier-based multi-level PWM schemes are presented which help to optimize or balance the switch utilization in multilevel inverters. A 10 Kw prototype six-level diode-clamped inverter has been built and controlled with the novel PWM strategies proposed in this paper to act as a voltage source inverter.

METHODOLOGY:

We propose an advanced footstep power generator system that uses piezo sensors and a Floor walk mechanism to generate power from human footsteps. The system allows for a platform for placing footsteps. The piezo sensors are mounted below the platform to generate a voltage from footsteps. The sensors are placed in such an arrangement to generate a maximum output voltage. This is then provided to our monitoring circuitry. The circuit is a microcontroller-based monitoring circuit that allows the user to monitor the voltage. This output is stored in the battery. It is a dc voltage that can be used on only DC electrical appliances. So the floor walk power output of DC voltage is converted to AC through the inverter section and the inverted output is used for electrical load.

BLOCK DIAGRAM OF THE PROPOSED MODEL:



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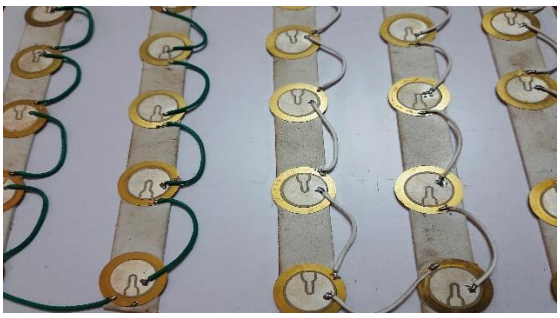
HARDWARE REQUIREMENT:

1.PIEZOELECTRIC ARRAY:

A crystal especially quartz, produces a potential difference across its opposite faces or terminals when system works under mechanical stress. Piezo materials have the property of developing an electric charge on their surface when mechanical stress is exerted at surface. Piezoelectric actuators withstand very high axial pressure due to their solid-state by nature. The properties of the actuator can vary to some extent depending on pre-stress or load conditions. This depends on the type of piezoelectric ceramics used.



2.FLOORING SYSTEM:

When the mechanical setup is used as it is, every single setup will compress separately and give an awkward feeling while walking over that. To prevent this, a flooring system is installed over the mechanical setup. The purpose of installing this flooring system is to provide required compression and at the same time to prevent people to feel uncomfortable when walking over it. Each and every component of the setup is connected using hinge arrangement. This along with the primary spring provides the required compression for the setup. This hinge arrangement distributes the weight of the person and prevents them from feeling the compression. But about 95% of the pressure applied due to the weight is conveyed for the compression.

3.ARDUINO UNO:

Arduino Uno is a microcontroller board based on the AT328P.It has 14 digital input/output pins, 6 Analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, and also 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 an AC-to-DC adapter or battery to get started. It is an open-source, computer hardware and software company, project, and user community that

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designs and manufactures kits for building digital devices and interactive objects that can sense and control objects in the physical world.

4.DC GENERATOR:

A DC generator is an electrical machine which converts mechanical energy into electricity. When the conductor slashes magnetic flux, an emf will be generated based on the electromagnetic induction principle of Faraday's Laws. This electromotive force can cause a flow of current throughout the circuit under closed condition.

5.LCD DISPLAY:

Liquid crystal cell displays are used in similar applications where LED displays are used with minimal application. These applications are a display of numeric and alphanumeric characters in dot matrix and segmental displays. Every indication requirement in the system will be matched by these displays only.

6.INVERTER:

An Inverter is an electronic device capable of transforming a Direct current (DC) into an alternating current (AC) at a given voltage and frequency. For our project, we have used a 6v/11w CFL inverter circuit which is suitable for a 6v load. This circuit converts the DC from the battery into AC through a network of diode, thyristors, capacitors, resistors, and coils. An AC output is given as an output which is then fed to the CFL light and the light glows.

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7.BATTERY CELLS:

Cells are the most basic individual component of a battery. They consist of a container like structure in which the electrolyte and the lead plates can interact with each other. Each lead-acid cell fluctuates in voltage in given range. small changes in voltage difference between a full and an empty cell.

SOFTWARE REQUIREMENTS:

SKETCH IDE – ARDUINO & NODE MCU MODULE PROGRAMMING SOFTWARE:

This name implies that Arduino uses for a program. The project's products are distributed as open source hardware and software, which are licensed under the GNU Lesser General Public License or the General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++.

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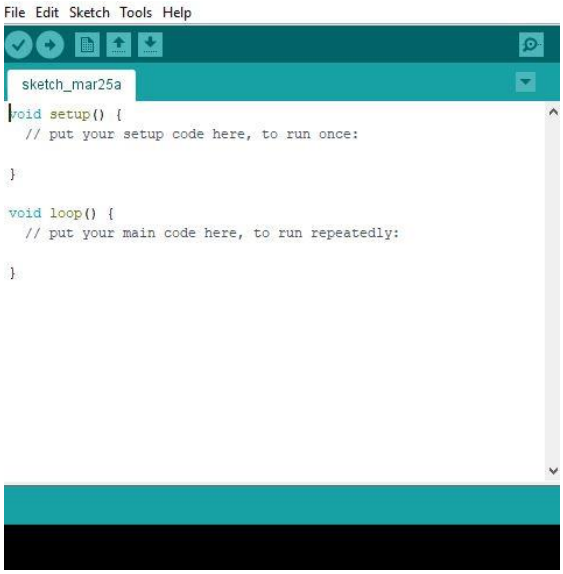
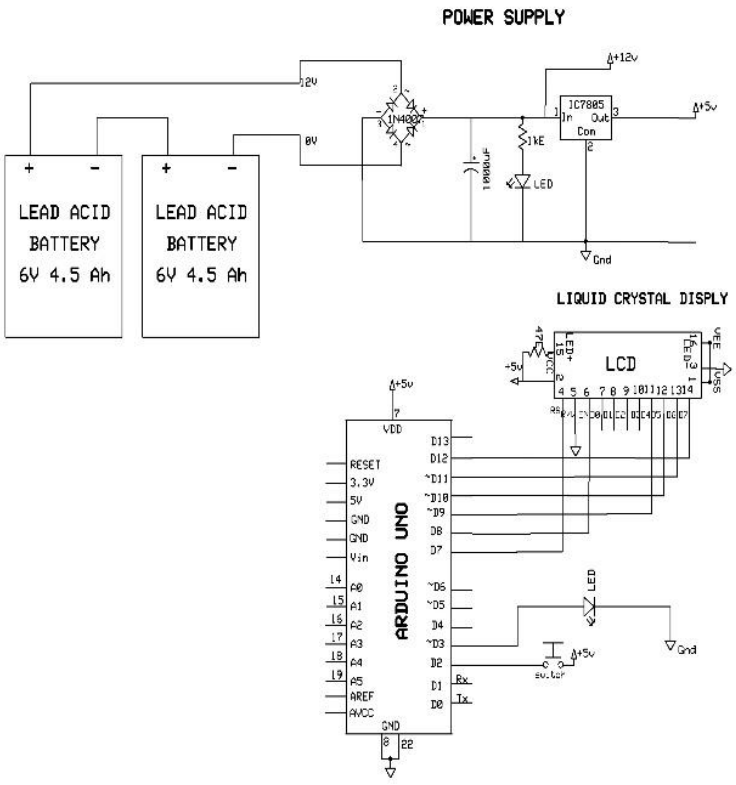


RESULT AND DISCUSSION:

The proposed Advanced footstep power generator system uses piezo sensors and a floor system mechanism to generate power from human steps. The piezoelectric array is placed above the flooring mechanism system. The output of the piezoelectric array and flooring system is connected to get maximum output. By this concept, single action produces 2X output. The circuit is a microcontroller-based monitoring circuit that allows the user to monitor the voltage. They generate the power is stored in the battery.

DESCRIPTION



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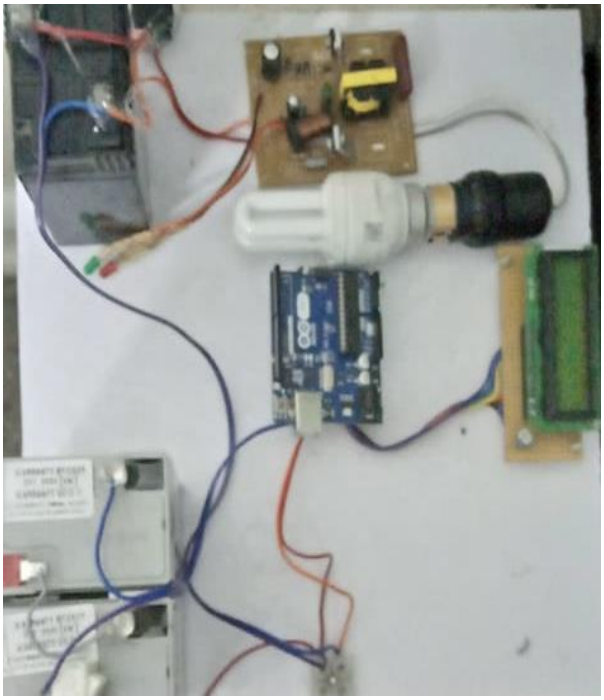
HARDWARE KIT



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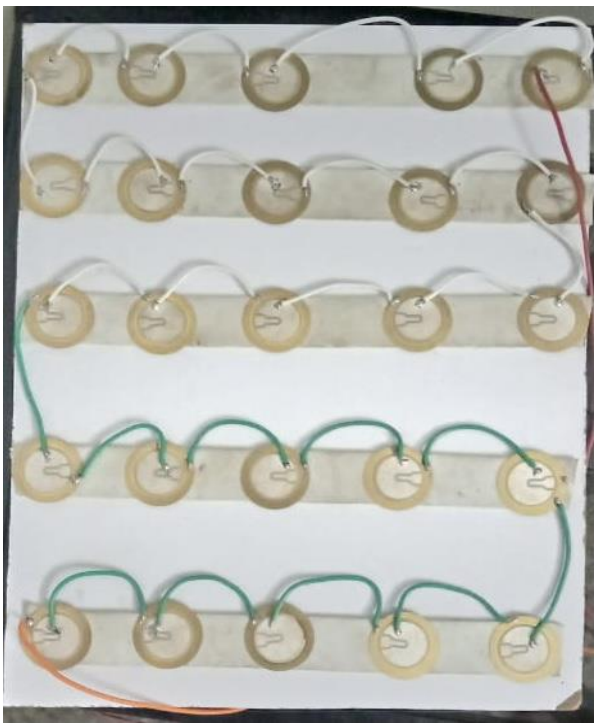

FUTURE SCOPE:

- Be able to generate about 1W of power for each step of the staircase.
- Be able to store significant power that can be used for basic lighting for at least one day.
- People should not spend too much energy activating the system.
- Be able to fit into small compartments like under the stairs.

CONCLUSION:

Project work is based on the idea of electric power generation without polluting the environment. The waste energy in form of human walking is utilized in the system. it is very useful at crowded places to install this system to produce electricity. This system is smoother and less noisy in operation and provides flexibility in working. This system plays an important role in producing electricity at places where there are no sources of electricity like village areas. This energy source is renewable and continuous. This technology would facilitate the future creation of new urban landscapes, athletic fields with a spectator area, music halls, theatres, nightclubs and a large gathering space for rallies, demonstrations, and celebrations, railway stations, bus stands, subways, airports, etc. like capable of harnessing human locomotion for electricity.

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