ADVANCED FOOT-STEP POWER GENERATION

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Abstract:

Power generation and its use is one of the issues. Now-a- days numbers of power sources are present, non- renewable & renewable, but still we can't overcome our power needs. Among these human population is one of the resources. In this project we are doing generation of power by walking or running. Power can be generated by walking on the stairs. The generated power will be stored and then we can use it for domestic purpose. This system can be installed at homes, schools, colleges, where the people move around the clock. When people walk on the steps or that of platform, power is generated by using weight of person. The control mechanism carries piezoelectric sensor, this mechanical energy applied on the crystal into electrical energy. When there is some vibrations, stress or straining force exert by foot on flat platform. It can be used for charging devices e.g. laptop, mobile, etc.

Key words: Energy Crisis, Supply and demand, Renewable Energy, Piezoelectric etc

Introduction:

Energy is nothing but the ability to do the work. In day to day life, Electricity is most commonly used energy resource. Now-a- days energy demand is increasing and which is life-line for people. Due to this number of energy resources are generated and wasted. Electricity can be generated from resources like water, wind etc. to generate the electricity from these resources development of big plants are needed having high maintenance cost. Some other energy resources are also costly and cause pollution. They are not affordable to common people. Electricity has become important resources for human being hence, it is needed that wasted energy must have to utilize, walking is the most common activity done by human being while walking energy is wasted in the form of vibration to the surface. And this wasted energy can be converted into electricity. Using the principle called piezoelectric effect.

Piezoelectric effect is the effect in which mechanical vibrations. Pressure or strain applied to piezoelectric material is converted into electrical form. This project gives idea about how energy is used on stepping on stairs. The use of stairs in every building is increasing day by day even small building has some floors when we are stepping amount of this wasted energy is utilized and converted to electricity by Piezoelectric effect. Piezoelectric effect is the effect of specific materials to generate an electric charge in response to applied mechanical stress.

Objective:

- To convert Kinetic Energy into Electrical Energy
- To use the renewable source to deal with energy crisis
- To overcome the pollution in environment

Literature review:

We are generating power in this project by walking or jogging. Walking up and down the stairs generates energy. The energy created will be stored, and we will be able to use it for home purposes. This system can be put in places where people travel around the clock, such as houses, schools, and colleges. When individuals walk on the steps or on a platform, the weight of the person generates power. The piezoelectric sensor in the control mechanism converts mechanical energy delivered to

the crystal into electrical energy. When there are vibrations, the foot exerts a tension or straining force on the flat platform. It can be used to charge gadgets such as laptops, phones, and other electronic devices. The piezoelectric effect is caused by mechanical vibrations.

Kinetic energy is one of the renewable energy sources. A significant amount of research was done to see if it was possible to transform kinetic energy into electricity. Nonetheless, the majority of past studies focused on the selection of appropriate materials and the sophisticated design of power generators. By installing a mechanical footstep power generator on the hind foot region, this research proposes a simple and low-cost mechanism to improve the performance and efficiency of energy conversion from kinetic energy to electricity energy. The mechanical footstep power generator in this study is based on the rack and pinion principle, with the goal of reducing the mechanical structure's complexity.

Proposed system

Electricity has become lifeline for human population. Demand of electricity is increasing day by day. Some technology needs high amount of electrical power to perform various operations. As we know electricity is generated by some sources like water, wind etc. To generate the electricity from these resources, development of big plants or big mills is needed having high maintenance cost. As the use of energy is increases, no of energy resources are generated and wasted. If the wastage of energy is rapidly increases then one day will come at that time we will face totally absence of energy

This technology is based on principle of piezoelectric effect which has ability to build up electrical charge from pressure and strain applied to them. Piezoelectric ceramics belongs to the group of ferroelectric materials. These materials are the crystals and they do not need electric field being applied.

Design and implementation

Block Diagram

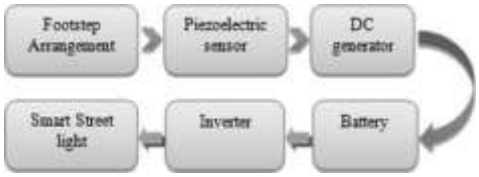

Fig 1. Block Diagram

Piezoelectric sensor:

Piezoelectric sensor is a device that uses the piezoelectric effect to measure change in acceleration, pressure, strain, temperature or force by converting this energy into an electrical charge. A transducer can be anything that convert one form of energy to another. The piezoelectric material is one kind of transducers. When we squeeze this piezoelectric material or apply any force or pressure, the transducer convert this energy into voltage. This voltage is a function of the force or pressure applied to it.

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Arduino UNO R3

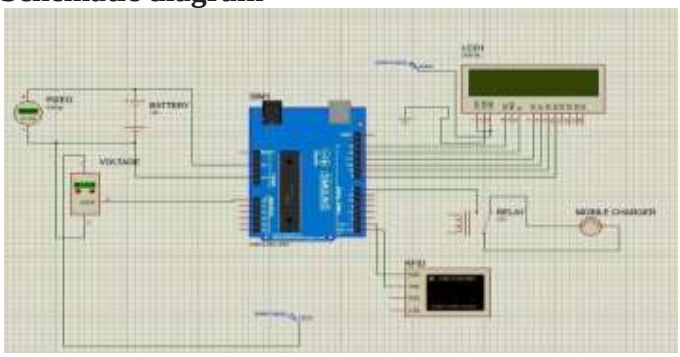
Fig.3.1. Arduino UNO

Arduino is a popular programmable board accustomed creates projects. It consists of an easy hardware platform also as a free source code editor which features a "one click compiles or upload" feature [5]. Hence the designed in way that any user can use it without necessarily being an expert programmer. Arduino offers an open-source electronic prototyping platform that's easy to use and versatile for both the software and hardware [6].Arduino is in a position to sense the environment through receiving input from several sensors [7].

Dc battery:

A battery may be a device which will store electricity. Some are rechargeable, and some are not. They store direct current (DC) electricit

Schematic diagram



Working:

Here we are going to generate voltage using footstep stress. The proposed system works as a basic medium to generate power using man force. it is very useful in public places like bus stands, theaters, railway stations, shopping malls, mostly crowdie areas etc. So, these applications are placed in public places where people walk and they have to travel on this prototype to get through the entrance or exist

When ever force is applied on piezo electric crystals that force is converted to Electrical energy is used to drive DC loads. And that minute voltage Which is stored in the Lead Acid battery. The battery is connected to the inverter. This inverter is used to convert the 12 Volt D.C to the 230 Volt A.C. This 230 Volt A.C voltage is used to activate the loads. We are using conventional battery charging unit also for giving supply to the circuitry

In this we are use 6 piezo plates which are going to generate power when the force is applied that voltage is transferring to charging circuit port

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- Whenever force is applied in the form of mechanical energy is stress on piezoelectric sensor, then the force is converted into electrical energy.
- Here, the output voltage is stored in the DC battery.
- The output voltage which is generated from the sensor is used to drive DC loads like any appliances
- For that we are using LED & a diode and one pin going to charge the battery one more wire directly connected to Arduino to monitor the voltage is coming from the sensor
- And we are using 1 voltage regulator & USB port charge the mobile
- So we are using Arduino board which is going to run the battery voltage 12v dc and in this controller we are writing the program hat monitor the voltage of piezo plates
- That piezo plates monitoring pin is directly connected topin number A4
- So it is reading from 0-5v & Max it generates 2-2.5v Dc
- We can see voltage in the LCD, the force is applied that voltage directly stored in the battery through this chargingcircuit
- And LCD we are using & data pins and two control pins and remaining all are supply pins ,those are directly connected to Arduino pins
- Like this we can monitor the voltage of piezo plates.

Results

Fig 5.1 Hardware result attached for reference

Advantages and applications

Advantages

- Power generation is simply walking on step.
- No need fuel input.
- This is a Non-conventional system.
- No moving parts - long service life.
- Self-generating - no external power required.
- Compact yet highly sensitive

Applications

- Foot step generated power can be used for agricultural, home applications, street-lighting.
- Foot step power generation can be used inemergency power failure situations.
- Metros, Rural Applications etc

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Conclusion & Future scope

The primary source of energy is generated by human footsteps. There is no requirement for energy from conventional sources, and this sort of power generating produces no pollutants. It is crucial to the places, all tracks where footsteps are used to generate non-conventional energy such as electricity, that there is no need for any form of power from the mains. It is a well-known fact that non- conventional energy contributes 11% of our primary energy. If this project is implemented, it will not only exacerbate and obstruct the energy shortfall, but it will also result in positive worldwide environmental change.

The project is being tried and updated, which is the most conservative, rational solution to prosperity for the people of our world. The concept of piezoelectric energy can be used in areas with frequent power-cuts and unstable power usage. In rural areas where agriculture works involving high power usage can be benefited by piezoelectric technology and also places where high crowd movements are involved can be benefited. We need to take steps which increases power generation from renewable sources to decrease carbon footprint at global levels. In modern times the contribution of renewable energy is just 11 percent for sustainable growth this number should be increased. Various developed economies such as France, Germany are taking steps towards the growth of renewable energy and related technology.

In future aspects we can use this technique in the speed breakers at high ways where are rushes of the vehicles too much thus increases input torque and ultimate output of generator, If we are used this principle at very busy stairs palace then we produce efficient useful electrical for large purposes.

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