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Power generation using Foot Step and Automated Street Lights

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ABSTRACT

As the natural resources like coal etc. on our planet which are used to produce electricity are getting exhausted. Hence an alternative solution for the production of electricity has to be found out. There are few methods that already exist like solar power, wind mill power etc. The drawback of these methods is cost of installation of these are high and also cannot be installed everywhere which are eliminated in our system. Every day we human beings walk for at least a kilometre and this physical energy thus produced from these steps can be used without it being wasted. Here we make use of the piezoelectric sensor on which when pressure is applied, voltage is generated. Depending on the voltage requirement the number of sensors can be increased. This can be used directly to small appliances or can be stored in a battery and then be used.

Keywords: *Electricity, Piezoelectric sensor,solar power, Wind power.*

I.Introduction

Nowadays electricityhas become a necessity along with the other basic needs for the existence of life on earth. As the population on our planet is increasing day by day. Due to this electricity is the most widely used and common resource of energy. There are few people who are still illiterate in rural areas and might find the usage of machines difficult and the energy produced might not be completely harnessed Hence our system is fully automated and needs no man power or time. The natural resources like water, wind etc. can be used to generate the electricity. But these resources development of big plants require high maintenance cost. There are many ways in which we can use human power to produce electricity such as hand crank and pedal generators. These require continuous attention by the human beings in order to generate electricity which also deprives them from doing any other activities.It is better to make use of the available sources of energy like the movement of humans while they are carrying out their daily activities. Here we can make use of the piezoelectric sensor which produces piezoelectric effect.

II. Motivation

There are multiple ways in which a piezoelectric sensor can be used to generate electricity. A few of them are they can be used in the sports shoes which when worn and run wearing it. Thus when the runner starts running, for each step a certain amount of pressure is applied on the sensor which can be used to charge a mobile on the run. There are many such applications which are user specific and very much defined to only those tasks. Thus we in this paper give a

more general and simple approach where the voltage from the sensor can be stored as well as used whenever required.

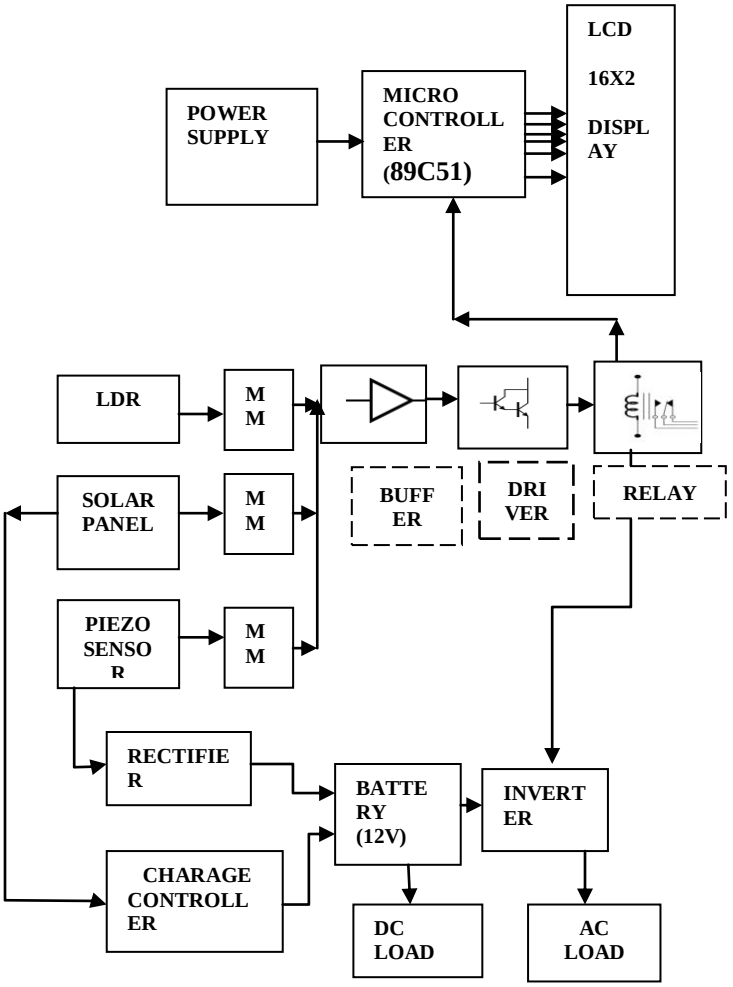
III. Literature Survey

In the existing system, the voltage from the piezoelectric sensor is directly given to any load like a mobile charger. But in our project the voltage from the sensor will be stored in the battery and this voltage will be used to power the LDR sensor which determines the brightness and accordingly will increase the brightness of the street light. Thus the automatic switch on and off of the street lights will be carried out by the voltage in the battery

III.Proposed Architecture

Firstly the piezoelectric sensors are connected with each other and placed under a tile or a sheet of metal. As people walk on it a certain amount of pressure is applied on the sensor which generates AC voltage. The amount of voltage that is produced will depend on the pressure which can come either from weight of the moving vehicles or from the weight of the people walking on it. Since the sensor is very sensitive, the output voltage will keep on fluctuating. This fluctuatingvoltage is given as an input to the full adder circuit that converts AC voltage into DC voltage. This voltage is then stored in a rechargeable battery. A direct connection can be given from the battery to the load in case of a DC load. The battery can then be connected to an inverter in case of an AC load.

Here we can give this to the LDR sensor which helps in the automatic control of street light. As the sun begins to set the sensor starts to glow depending on the brightness of sunlight. Once it is fully dark, the sensor activates the street light. As the sun starts to rise again the LDR begins to reduce the brightness and the street light is completely off once the sun rises completely.



MM: Monostable Multivibrator

LDR: Light Dependent Resister

Fig 1: proposed system block diagram

IV. Prototype working

Buffers are the circuits that normally do not change the logical state of a digital signal and also are useful in providing extra current drive at the output but can also be

used to regularize with the same logic state present at an interface. Driver section in a circuit has a property to amplify the current which comes from the relay circuit. We make use of an electromagnetic device to which a load can be driven that is connected across the relay.

A. Piezoelectric Sensor

It is a sensor that uses piezoelectric effect to measure changes in pressure, temperature, strain or force by converting them into an electrical charge. They are made up of either gallium phosphate or tourmaline or quartz. The piezoelectric sensor has 2 leads, a positive lead and a negative lead. The red lead is the positive lead and the black lead is the negative lead. This has a strain sensitivity of 5V/με

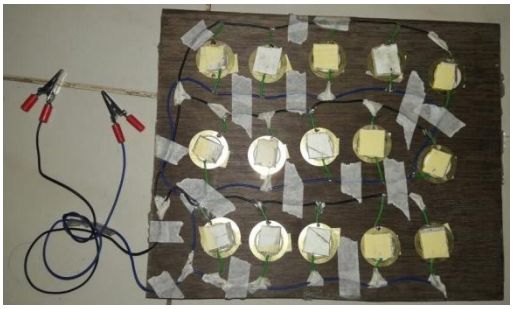


Fig 2: connection of piezoelectric sensor

B. Monostable Multivibrator

A device which has one output state is called monostablemultivibrator. This when triggered will always produces a single output pulse. The time constant of the RC circuit isused in determining the duration until which it returns back to its original state.

C. Buffer

The buffer we make use of is IC 4050 which is a 16 pin IC. This is a non-inverting Hex Buffer which is used for logic level conversion. The operating voltage for this IC is 3-15V. The IC provides isolation to the main circuit from varying input signals. It consumes 0.01milliWatt power with noise immunity of 3.7 V and toggle speed of 3 Megahertz.

D. Microcontroller

This device can be defined as a single chip computer, which is made to make it work as all of the functional sections (CPU, RAM, ROM, I/O, ports and timers) on a single IC. These are also called as special purpose computers with a different purposes that separate them from others. Since these are put into a device, the another name it can be referred with is "embedded controller." They can do only one task at a time.

The program is stored in ROM (read-only memory) and generally does not change. Microcontrollers are often low-power devices. A battery-powered microcontroller might as well consume 50 mill watts.

E. Solar Panel

Solar panel refers either to a photovoltaic module, a solar thermal energy panel, or to a set of solar photovoltaic (PV) modules electrically connected and mounted on a solid structure. To generate and supply electricity in commercial and residential applications we can make use of solar panels. The efficiency of a module determines the area of a module given the same rated output - an 8% efficient 230 watt module will have twice the area of a 16% efficient 230 watt module. There are a few solar panels available that are exceeding 19% efficiency. A solar module is more like a piezoelectric sensor which produces only a limited amount of power when a single sensor or module is used in the circuit

F.Solar Cells

The next step in making solar panels work to produce solar power is getting these electrons to flow in one direction, producing electric current. This is accomplished by adding impurities to the silicon crystal, process manufacturers of solar panels call "doping." One part of the crystal is doped with phosphorus. Phosphorus contains one more electron than silicon and creates a net negative charge. The other part is doped with boron, which contains one fewer electron, working to create a net positive charge.

V. Conclusion

The project "POWER GENERATION USING FOOT STEP AND AUTOMATED STREET LIGHTS" is successfully tested and implemented, it provides the affordable energy solution for the electricity generation in a developing nation like India as well as energy management can be easily done because of the street light automation application that we have done in our project. Not only for this purpose, this type of power supply from the piezoelectric sensor when used in the rural areas will help to solve the crisis faced by them and also makes it more safer. By using this project we can have both ac as well as dc applications. It is especially best suited for implementation in crowded areas. This can be used in street lighting without use of long power lines. It can also be used as charging ports, lightings in buildings as well as many other applications.

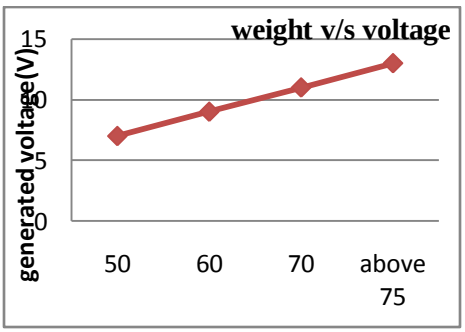
VI. Results

As the test results that are given below shows that the weight of a person is a factor in determining the ac voltage that is generated. Here the table and the graph gives the statistics for the tests conducted on 15 piezoelectric sensors. When put in the public areas where people tend to walk more frequently will help in the generation of electricity.

TABLE I:
GENERATED VOLTAGE FROM PIEZOELECTRIC SENSORS CONNECTED IN PARALLEL

Sl.no.	Input Weight (in KG)	Generated output voltage (in volts)
1.	50	7
2.	60	9
3.	70	11
4.	>75	>13

GRAPH OF GENERATED VOLTAGE



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