CHAPTER: 1

INTRODUCTION

Introduction:

Footstep step generation system basically converts force energy of foot into electric energy by using piezoelectric sensor. Piezoelectric sensor is a transducer which converts mechanical energy into electric energy which is used for different applications. Today, electricity has become a life line of human population. The concern about the gap between demand and supply of electricity has led to alternate sources of energy and its sustainable use. Linear increase of human population and energy demand led to the invention of a method to provide power from the increased population. This technology utilizes piezoelectric effect, in which the materials have the ability to generate electricity from pressure and force applied to them. The ability of some materials to generate electric potential in response to applied pressure is piezoelectricity. Energy harvesting becomes a waste if not utilized properly. Pressure exerted by moving people can be converted to electric current with the help of embedded piezoelectric crystals. It is a non- conventional energy production mechanism. Transducers are used to convert mechanical energy of footsteps into electrical energy. The system can be implemented on roads, bus stations and many public places. Piezoelectric materials act as transducers and pressure exerted by the moving people transformed into electric current.

At display, power has turned into a help for human populace. Its request is expanding step by step. Present day innovation needs an immense measure of electrical power for its different activities. Power generation is the single biggest wellspring of contamination in the entire world. At one hand, rising worry about the hole amongst request and supply of power for masses has featured the investigation of interchange wellsprings of vitality and its economical utilize. Then again, human population is increasing everywhere throughout the world and thus vitality request is expanding step by step directly. In like manner, it is a target of the present development to give a technique for electrical power generation from this regularly expanding human populace that does not adversely affect the earth. This innovation depends on a rule called the piezoelectric impact, in which certain materials can develop an electrical charge from having weight and strain applied on them. Piezoelectricity alludes to the capacity of a few materials to produce an electric potential in light of connected weight. Inserted piezoelectric material can give the enchantment of changing over weight applied by the moving individuals into electric current. Human-fuelled transport has been in presence since time immemorial through strolling, running and swimming. However current innovation has prompted machines to upgrade the utilization of human control in more effective way. In this specific circumstance, pedal power is an astounding wellspring of vitality and has been being used since

nineteenth century making utilization of the most capable muscles in the body.

Ninety-five Percent of the effort put into pedal power is changed over into vitality. Pedal power can be connected to an extensive variety of employments and is a straightforward, shoddy, and helpful wellspring of vitality. Be that as it may, human dynamic vitality can be valuable in various ways however it can likewise be utilized to create power in view of various methodologies and numerous associations are as of now actualizing human controlled advances to produce power to control electronic devices.

CHAPTER 2:

LITERATURE REVIEW

2. LITERATURE REVIEW:

To generate electrical energy from the footsteps there are several methods i.e. gear wheel and fly wheel to produce power. These are used in places where there is a lot of people's movement to generate power because the mechanical portion of this will work on the principle. Footstep from crowed on floor and piezo plate scheme that is used below the floor is done for the generation of power, piezo plate will be covered by the sheet and piezo sensor experience a vibrating force by the spring. Electric power will be generate in form of electric current by the striking of piezo plate on the floor. Power generated by the footsteps is used for the additional features like light or street light used at the place of pedestrian's. Credit is given to the pedestrian for the energy which they produced

Day by day, the population of the country increased and the requirement of the power is also increased. At the same time the wastage of energy also increased in many ways. So reforming this energy back to usable form is the major solution. As technology is developed and the use of gadgets, electronic devices also increased. Power generation using conservative methods becoming deficient. There is a necessity arises for a different power generation method. At the same time the energy is wasted due to human locomotion and many ways. To overcome this problem, the energy wastage can be converted to usable form using the piezoelectric sensor.

This sensor converts the pressure on it to a voltage. So by using this energy saving method that is the footstep power generation system we are generating power. Energy is nothing but the ability to do work. Power has turned into help for the human populace nowadays. Its request is expanding rapidly. In day to day, life innovation needs an immense measure of electrical power for its different activities. Power generation is the single largest wellspring of contamination in the world. Due to which numerous energy resources are produced and wasted.

Electricity is generally generated from resources like water, wind, coal, etc. for generating the electricity from these resources development of big plants that are needed having high maintenance and high cost. In like manner, it is the target of the present development to give the technique for electrical power generation from which regularly expanding human populace that does not adversely affect the natural resources. This innovation depends on a rule called the piezoelectric effect impact, in which certain materials can develop an electrical charge from having weight, the strain applied to them.

The piezoelectric effect is the effect of specific materials to generate the electric charge in response to applied mechanical stress on it. It is the effect in which mechanical vibrations, pressure

or strain applied to the piezoelectric material are converted into electrical form. Piezoelectricity alludes to the capacity of a few materials to produce and electric potential in light of connected weight.

The inserted piezoelectric material can give the enchantment of the changing overweight applied by moving individuals into the electric current, which is stored in a battery and further distributed using Microcontroller.

CHAPTER 3:

SCOPE OF THE PROJECT.

To design and implement:

- To generate using footstep
- To design and develop the model of stair case power generation

OBJECTIVES:

The aim of this project is:

- To develop much cleaner cost effective way of power generation method
- Trying to utilize the west energy in a useful way
- Power generation through footstep as a source of renewable energy that can obtained while walking

Scope:

- Footstep arrangement is used to generate the electric power. As the power demand is increasing, this arrangement is used to generate the electrical power in order to meet the large energy demand. In this arrangement the mechanical energy is converted into electrical energy.
- Has large potential and option for the non-conventional energy source.
- It can be directly implemented in shoes to generate power On-the-Go.
- It can be increased for multiple chargers.

CHAPTER 4:

METHEDOLOGY

- **BLOCK DIAGRAM AND ITS WORKING:**

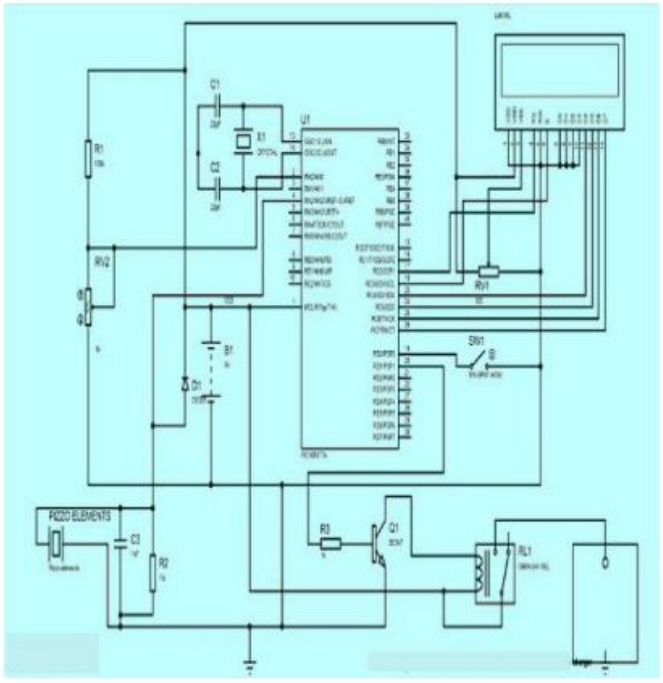


Figure 0.1: Footstep power Generation System using Microcontroller.

Working:

Piezoelectric sensor interfaced with microcontroller and used as a transducer to convert force energy into electrical energy

It is consists of large number of Piezoelectric sensors connected in series. Kinetic energy of series connected transducers is converted into electrical energy.

Voltages generated by piezoelectric sensors are feed to circuit elements to get proper output.

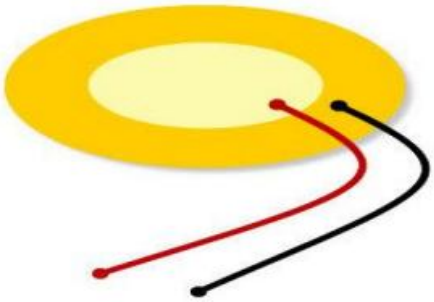
Output energy is stored in batteries

CHAPTER 5:

DETAIL OF DESIGN WORKING AND PROCESS

- **Piezoelectric Sensor**

A sensor that utilizes the piezoelectric effect, to measure changes in acceleration, strain, pressure, and force by converting them into electrical charge is called as a piezoelectric sensor. Piezo is a Greek word which means 'press' or 'squeeze'. Piezoelectric effect causes the occurrence of electric dipole moments in solids due to the pressure applied to certain solid materials such as piezoelectric crystals, ceramics, bone, DNA, and some proteins that generates electric charge. This generated piezoelectricity is proportional to the pressure applied to the solid piezoelectric crystal materials. In this article, we will discuss about one of the most frequently used piezoelectric sensor applications, that is, piezo sensor switch.



- **Lead Acid Battery**

Battery (electricity), an array of electrochemical cells for electricity storage, either individually linked or individually linked and housed in a single unit. An electrical battery is a combination of one or more electrochemical cells, used to convert stored chemical energy into electrical energy.

Batteries may be used once and discarded, or recharged for years as in standby power applications. Miniature cells are used to power devices such as hearing aids and wristwatches; larger batteries provide standby power for telephone exchanges or computer data centers.

Lead-acid batteries are the most common in PV systems because their initial cost is lower and because they are readily available nearly everywhere in the world. There are many different sizes and designs of lead-acid batteries, but the most important designation is that they are deep cycle batteries. Lead-acid batteries are available in both wet-cell (requires maintenance) and sealed no-maintenance versions. Lead acid batteries are reliable and cost effective with an

exceptionally long life. The Lead acid batteries have high reliability because of their ability to withstand overcharge, over discharge vibration and shock.

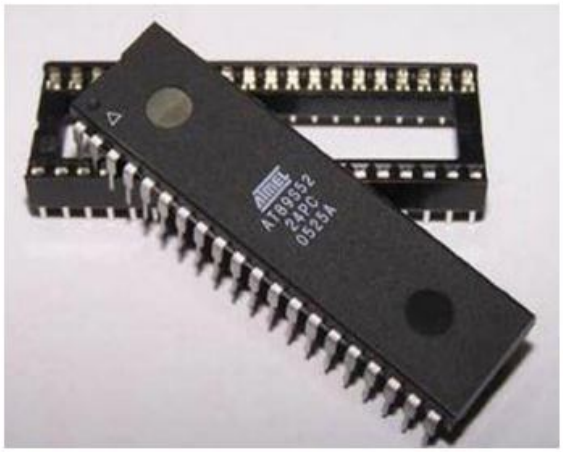
The use of special sealing techniques ensures that our batteries are leak proof and non spoilable. The batteries have exceptional charge acceptance, large electrolyte volume and low self-discharge, which make them ideal as zero- maintenance batteries lead acid batteries Are manufactured/ tested using CAD (Computer Aided Design).

These batteries are used in Inverter & UPS Systems and have the proven ability to perform under extreme conditions. The batteries have electrolyte volume, use PE Separators and are sealed in sturdy containers, which give them excellent protection against leakage and corrosion.

- **AT89S52 Microcontroller**

The AT89S52 comes from the popular 8051 family of Atmel Microcontrollers. It is an 8-bit CMOS microcontroller with 8K as Flash memory and 256 bytes of RAM. Since it is similar to the trust worthy 8051 architecture these microcontrollers are as per industry standard. It has 32 I/O pins comprising of three 16-bit timers, external interrupts, full-duplex serial port, on-chip oscillator and clock circuitry.

The Microcontroller also has Operating mode, Idle Mode and Power down mode which makes it suitable for battery operated applications. Few considerable drawback of the microcontroller is that it does not have in-built ADC and does not support SPI or I2C protocols. However you can utilize external modules for the same.



- **Unidirectional Current controller:**

As name indicates this circuit allows only one direction current flowing. There are following some devices allow on unidirectional current.

1) Diode

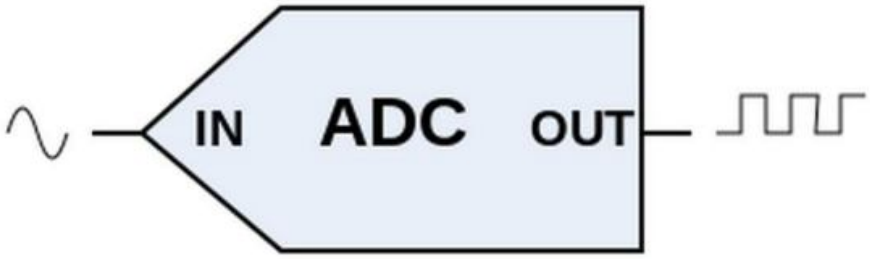
2) Thyristors

In this project we are going to use diode as Unidirectional Current control device. As we are already familiar with the most common function of a diode is to allow an electric current to pass in one direction (called the diode's forward direction). While blocking current in the opposite direction (the reverse direction). Thus, the diode can be thought of as an electronic version of a check valve. The diode used in this project is D=1N4007.

- **Analog to Digital Converter:**

An analog-to-digital converter (abbreviated ADC, A/D or A to D) is a device that converts a continuous quantity to a discrete time digital representation. An ADC may also provide an isolated measurement. The reverse operation is performed by a digital-to-analog converter (DAC).

Typically, an ADC is an electronic device that converts an input analog voltage or current to a digital number proportional to the magnitude of the voltage or current. However, some non-electronic or only partially electronic devices, such as rotary encoders, can also be considered ADCs



- **Inverter:**

An inverter is an electrical device that converts direct current (DC) to alternating current (AC); the converted AC can be at any required voltage and frequency with the use of appropriate transformers, switching, and control circuits.

Solid-state inverters have no moving parts and are used in a wide range of applications, from small switching power supplies in computers, to large electric utility high-voltage direct current applications that transport bulk power. Inverters are commonly used to supply AC power from DC sources such as solar panels or batteries.

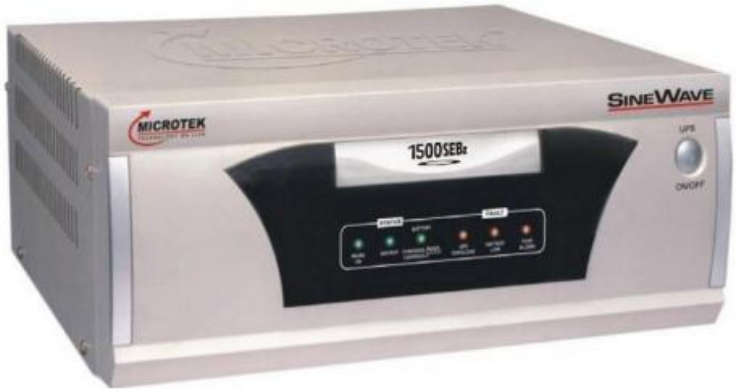
There are two main types of inverter. The output of a modified sine wave inverter is similar to a square wave output except that the output goes to zero volts for a time before switching positive or negative. It is simple and low cost and is compatible with most electronic devices, except for sensitive or specialized equipment, for example certain laser printers.

A pure sine wave inverter produces a nearly perfect sine wave output (<3% total harmonic distortion) that is essentially the same as utility-supplied grid power. Thus it is compatible with all AC electronic devices. This is the type used in grid-tie inverters.

Its design is more complex, and costs 5 or 10 times more per unit power. The electrical inverter is a

high-power electronic oscillator.

It is so named because early mechanical AC to DC converters was made to work in reverse, and thus were "inverted", to convert DC to AC. The inverter performs the opposite function of a rectifier.



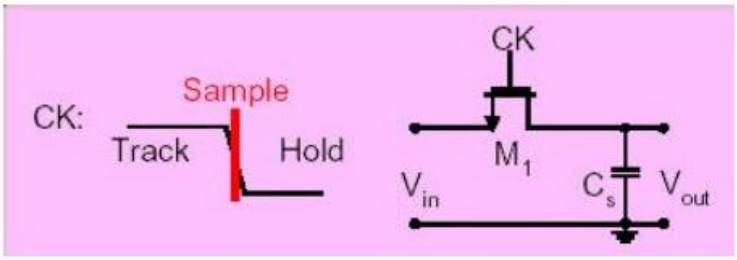
- **Voltage sampler:**

Sample-and-hold (S/H) is an important analog building block with many applications, including analog-to-digital converters (ADC) and switched-capacitor filters. The function of the S/H circuit is to sample an analog input signal and hold this value over ascertain length of time for subsequent processing.

Taking advantages of the excellent properties of MOS capacitors and switches, traditional switched capacitor techniques can be used to realize different S/H circuits. The simplest S/H circuit in MOS technology is shown in Figure, where Vin is the input signal, MI is an MOS transistor operating as the sampling switch, Ch is the hold capacitor, ck is the clock signal, and Vout is the resulting sample-and-hold output signal.

In the simplest sense, a S/H circuit can be achieved using only one MOS transistor and one capacitor. The operation of this circuit is very straightforward. Whenever ek is high, the MOS switch is on, which in turn allows Vout to track Vin. On the other hand, when ck is low, the MOS switch is off.

During this time, Ch will keep Vout equal to the value of Vin at the instance when ck goes low. CMOS Sample-and-Hold Circuits Page. Unfortunately, in reality, the performance of this S/H circuit is not as ideal as described above. The next section of this paper explains two major types of errors, charge injection.and clock feed through, that are associated with this S/H implementation. The section after that presents three new S/H techniques, all of which try to minimize the errors caused by charge injection and/or clock feed through.



16X2 LCD

LCD modules are very commonly used in most embedded projects, the reason being its cheap price, availability and programmer friendly. Most of us would have come across these displays in our day to day life, either at PCO's or calculators. The appearance and the pinots have already been visualized above now let us get a bit technical. The 16X2 LCD display is used to display the messages prompting to input time-table information. It is connected to the Arduino board by connecting its data pins to pins 3 to 6 of the Arduino board. The RS and E pins of the LCD are connected to pins 13 and 12 of the Arduino Mega respectively The RW pin of the LCD is grounded.16×2 LCD is named so because; it has 16 Columns and 2 Rows. There are a lot of combinations available like, 8×1, 8×2, 10×2, 16×1, etc. but the most used one is the 16×2 LCD. So, it will have (16×2=32) 32 characters in total and each character will be made of 5×8 Pixel Dots. A Single character with all its Pixels is shown in the below picture.

Working:

A liquid crystal display or LCD draws its definition from its name itself. It is combination of two states of matter, the solid and the liquid. LCD uses a liquid crystal to produce a visible image. Liquid crystal displays are super-thin technology display screen that are generally used in laptop computer screen, TVs, cell phones and portable video games. LCD's technologies allow displays to be much thinner when compared to cathode ray tube (CRT) technology.Liquid crystal display is composed of several layers which include two polarized panel filters and electrodes. LCD technology is used for displaying the image in notebook or some other electronic devices like mini computers. Light is projected from a lens on a layer of liquid crystal. This combination of colored light with the grayscale image of the crystal (formed as electric current flows through the crystal) forms the colored image. This image is then displayed on the screen.


LCD-16x2Y
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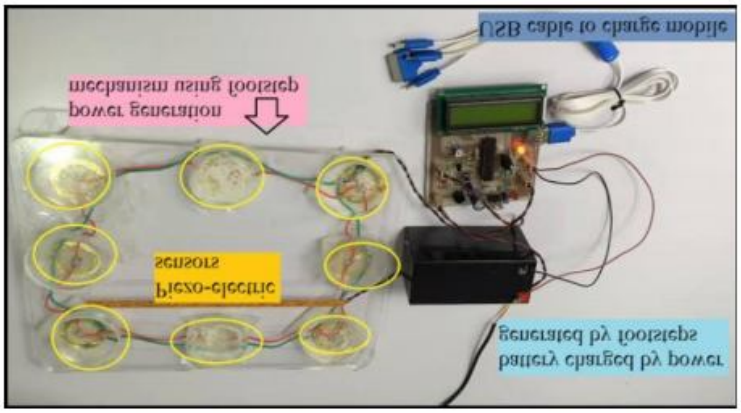
CHAPTER 6:

RESULT AND APPLICATION

- **Results showing Output:**

OUTPUT:



APPLICATION:

Foot step power generation system has many applications, but some of them are given below:

- Mobile charging
- street lighting
- bus station lighting
- emergency power failure stations
- Rural areas etc
- Can be broadly utilized as a part of colleges, schools and universities.
- This can be actualized in air terminals, transport stations, railroad stations.
- Street lights can be actualized utilizing this strategy.
- This framework can be actualized in swarmed places like shopping centers, pathways and so for

CHAPTER 7:

CONCLUSION

- **CONCLUSION:**

Footstep arrangement is used to generate the electric power. As the power demand is increasing, this arrangement is used to generate the electrical power in order to meet the arge energy demand. In this arrangement the mechanical energy is converted into electrical energy. The project FOOT STEP POWER GENERATION is an afford-able energy solution to common people. This can be used for many applications in rural areas where power availability is less or totally absence As India is a developing country where energy management is a big challenge for a huge population. By using this project we can drive both AC and DC loads according to the force we applied on the piezoelectric sensor to charge electronic vehicles and reduce the amount of pollutants which cause a negative impact on the environment.

CHAPTER 8:

APENDIX

UNIT COST:

Sr.no	COMPONENT	COST
1	AT89S52 Microcontroller	250
2	Piezoelectric Sensor	49
3	Diode	05
4	Resister	05
6	16X2 LCD	249
7	Lead Acid Battery	780
8	ADC	142
9	INVERTER	440
10	Capacitor	05
11	PCB	30
12	Switch	60
13	Crystal	05
14	Connecting wires	100
	Total =	2115

CHAPTER 9:

REFERENCE

REFERENCE:

- https://www.elprocus.com/footstep-power-generation-system/
- https://www.ijert.org/advanced-footstep-power-generation-system-to-charge-e-vehicleshttps://nevonprojects.com/advanced-footstep-power-generation-system/
- https://www.slideshare.net/AhabKhan/foot-step-power-generation-using-piezoelectric-material
- https://www.slideshare.net/AhabKhan/thesis-of-footstep-power-generation
- https://www.ijert.org/advanced-footstep-power-generation-system-to-charge-e-vehicles