CHAPTER 1

INTRODUCTION

The word “smart” is not a new word in the 21st century – it is a word used to describe a system created to reduce the effort of human labour to the bare minimum. For example, a smart phone which has made human interaction over several kilometers seem so simple, with various interacting applications in it. These kind of systems are referred to as Cyber-physical systems. Footwear is an irreplaceable part of human life across the globe. While the initial necessity was purely to protect the feet, they have also become a symbol of style and personality. Footwear acts as the interface between the ground and the wearer’s foot. Smart shoe is a technology in which the shoe or its insoles are connected to a smartphone application that uses Google maps, and then vibrate to tell users when and where to turn to reach their destination .

1.1 BACK GROUND

The aim of Energy harvesting is to capture free energy, available without costs, from the
environment. The advanced techniques allowed us to capture, store and to manage natural energy, transforming them into electrical energy. From the point of view of wearable electronic devices, the most efficient energy harvesting system for capturing energy is to use devices such as SMART SHOES.

This project would incorporate that feature into it but adding a twist into the idea and implementing it into a shoe, this shoe would work with vibration motors embedded there in to give the user directions based on the location the user puts into the app on the phone.

Piezoelectric Effect is the ability of certain materials to generate an electric charge in response to applied mechanical stress.

When a person walks, he loses energy to the road surface in the form of impact, vibration, and sound,due to the transfer of his weight to the road surface through

how the foot falls on the ground during each step. This energy can be tapped and converted in the usable form such as in electrical form. The principle behind this is piezoelectricity.

In short, the aim of this project is to design and construct a smart shoe which generates its own power through walking.

Development of wearable energy harvesters, which harvest the mechanical energy dissipated in human motion to provide renewable and clean energy.

Piezoelectric energy harvesters and nano-triboelectric generators can convert mechanical energy into electric energy directly, thus their structures are more compact and simpler in comparison to those of other types. The materials for nano-triboelectric generators are generally not accessible in the market, hence this work focuses on piezoelectric energy harvesters. Lead zirconatetitanate (PZT) and polyvinylidene difluoride (PVDF) are the two most important piezoelectric materials for energy harvesting, owing to their high piezoelectric performance. PZT is rigid, brittle, and heavy, bringing limitations in wearable applications where flexibility is necessary. PVDF has considerable flexibility, good stability, and is easy to handle and shape.

The mechanical energy dissipated in shoes can even power a computer, serving as an attractive energy source for wearable harvesters. This paper develops a shoe-embedded piezoelectric energy harvester, which can be integrated in a shoe readily for energy harvesting from human locomotion with little discomfort for the wearers. The harvester is based on a specially designed sandwich structure, resulting in a thin geometrical form, a high performance and an excellent durability. Two harvester prototypes are made and tested. The first one is made up of a multilayer PVDF film and a structure of engineering plastics, which is placed under the heel.

The second one is designed as an insole shape and used as a normal insole, consisting of a structure of flexible silicone rubber and two multilayer PVDF films. More power can be generated by the former prototype, while the other one has an advantage of remarkable comfort. In order to store the harvested energy and

provide a constant DC output voltage, a power management circuit is designed.

Piezo electricmaterials can be used as a means of transforming ambient vibrations into electrical energy that can then be stored and used to power other devices.

1.2 MOTIVATION

When a person walks pressure is exerted on the ground and this pressure Can be converted into electrical energy and it can be used to power Electronic devices. The power is generated by piezoelectric generator when a person walks is transferred to the device by using a mid range wireless Power transfer which is a resonance coupling technique, in the recent years there has been increasing interest in research a Development of advanced smart phone technology and so some of the problem Associated with it. And one among those fast draining of battery . imagine your phone getting charged everywhere you go . This is possible by piezo electric pow Transfer technique harvesting mechanical energy from human motion is an attractive approa for clean and sustainable electricity. Piezoelectricity is electrical energy produce From mechanical pressure such as walking ,running.Energy is harvested from the human body movements and transmit.

New technology harvests power from a small generator embedded in the sole of a shoe. It is based on new voltage regulation circuits that efficiently convert a piezoelectric charge into usable voltage for charging batteries or for directly powering electronics.

When a person walks, pressure is exerted on the ground and this pressure can be converted into electrical energy and it can be used to power electronic devices. In this paper a Mobile charging system is designed. A piezo electric generator is placed in the shoe. The power that is generated by piezo electric generator when a person walks is transferred to the device by using a mid-range wireless power transfer (WPT) which is a Resonance coupling technique.

A huge amount of 3.4 trillion calories of energy is being burnt by people just while

walking. This nasty number of calories of energy being burnt everyday motivated me to do this project with which energy can be generated that can be used to power few electronic boards and mobile just while walking.

1.3 PURPOSE OF THE PROJECT

The aim of our project is to build a system that can generate power from that energy which was previously used to get lost.Our project is extremely simple but highly useful.This system when applied on large scale can generate very high amount of power this power then can be used for up liftment of the civilization.

Once the power is generated it can be used to charge a cell phone. We can either directly connect the cell phone to the main circuit or first charge a rechargeable battery and then use that battery to charge the mobile phone.

This system can be used to charge any gadget which supports rechargable battery. It is not confined to only mobile phones.

when ever people walk on the way it will leadto the generation of power.

That can produce energy from vibration and pressure available on some other term (like people walking).

This project describes the use of piezoelectric materials in order to harvest energy from people walking vibration for generating and accumulating the energy. This concept is also applicable to some large vibration sources which can find from nature.

This project also represents a footstep of piezoelectric energy harvesting model which is cost effective and easy to implement.

CHAPTER 2

LITERATURE ON SURVEY

- MARKETING SURVEY ON EXISTING SOLUTIONS
- Power Harvesting System in Mobile Phones and Laptops using Piezo electric Charge Generation
- KarthikKalyanaraman has proposed energy conservation system for mobilephones and laptop keyboards have been presented in this paper. The design presented here will be quite effective in providing an alternate means of power supply for the mentioned devices during emergency. Further, the approach presented in this paper can be extended to many other applications where there is scope for similar kind of energy conservation. The material used for the current application is a PZT with 1.5 Mba lateral stresses operating at 15Hz. The volume of the material used is 0.2cm3.
- The output power produced is 1.2W.
- The energy/power density is 6mW/cm3.
- The output voltage is 9V.
- This voltage can be used to produce the required amount of charge after being processed.

- No fuel is needed to generate the power .
- Minimum energy needed to pump water .Etc
- Recharge your smart phone using your body heat.

- Generation costs are low

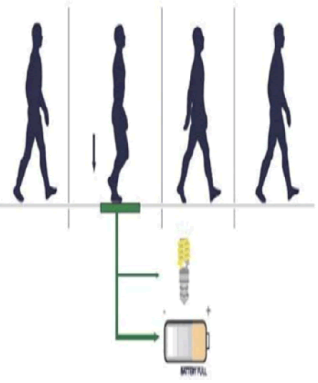
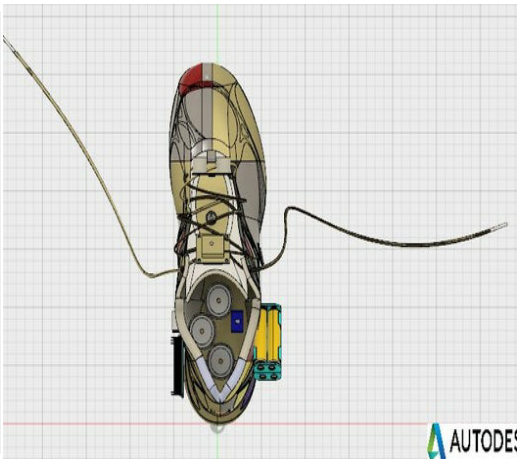


Figure 1: Footstep energy harvesting.

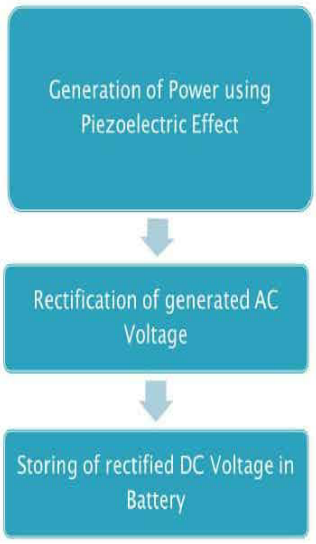


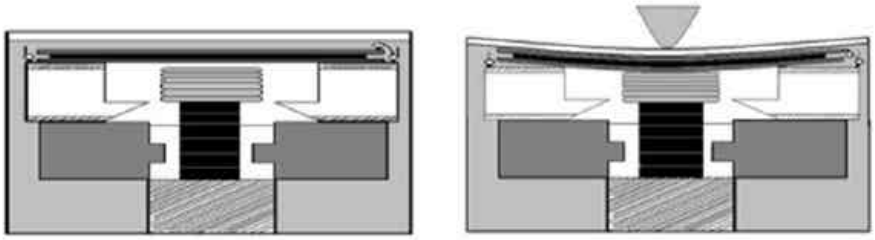
2.2 PROJECT OBJECTIVE

In this project I try to develop a piezoelectric generator. That can produce energy from vibration and pressure available on some other term (like people walking). This project describes the use of piezoelectric materials in order to harvest energy from people walking vibration for generating and accumulating the energy. This concept is also applicable to some large vibration sources which can find from nature. This project also represents a footstep of piezoelectric energy harvesting model which is cost effective and easy to implement.

The devices are used in a large number to comfort our daily lives. With the increase in energy consumption of these portable electronic devices, the concept of harvesting alternative renewable energy in human surroundings arise a new interest among us.

BLOCK DIAGRAM OF EMBEDDED SYSTEM





THREE BASIC ELEMENTS OF A MICRO PROCESSOR

Primary battery

Primary batteries can produce current immediately on assembly. Disposable batteries are intended to be used once and discarded. These are most commonly used in portable devices such as in alarm and communication circuits where other electric power is only intermittently available. Disposable primary cells cannot be reliably recharged, since the chemical reactions are not easily reversible and active materials may not return to their original forms. Battery manufacturers recommend against attempting recharging primary cells.

Secondary battery

Secondary batteries must be charged before use; they are usually assembled with active materials in the discharged state. Rechargeable batteries or secondary cells can be recharged by applying electrical current, which reverses the chemical reactions that occur during its use. Devices to supply the appropriate current are called chargers or rechargers.

The model of thewalk charger*is* a shoe with:

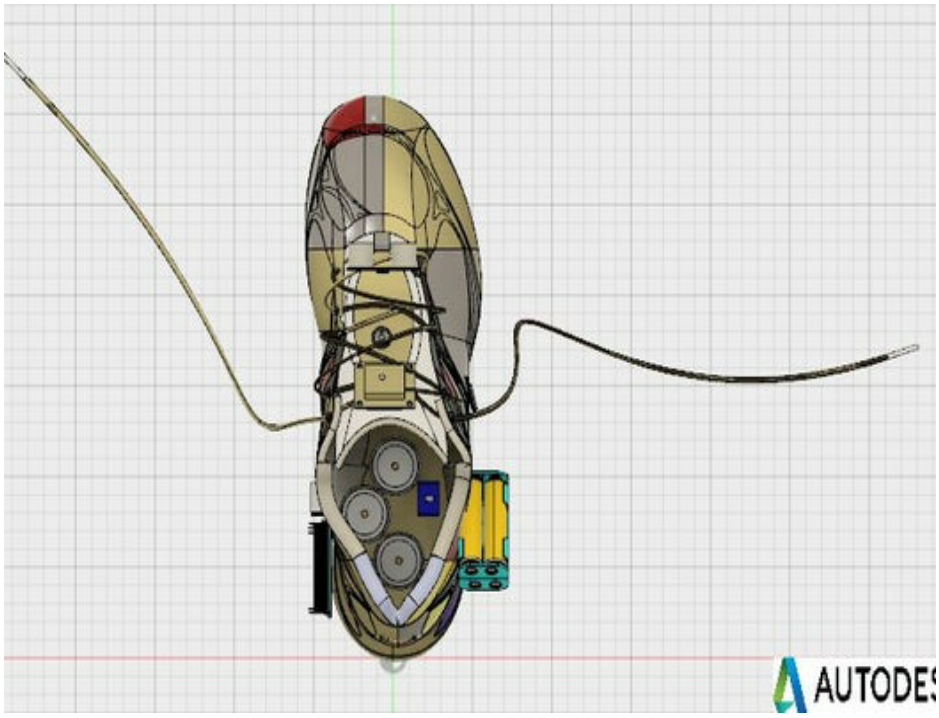
- ✓ **a thick heel to insert a device into it &**
- ✓ **simultaneously maintain the height of the shoe.**

The main circuit consists of:

- ✓ **a miniature gearbox**
- ✓ **spring**
- ✓ **a 3000 to 4000 rolled copper wire**
- ✓ **magnets**
- ✓ **wires and mobile battery &**
- ✓ **piezocell**

CHAPTER 3

PROPOSED DESIGN



CHAPTER 4

METHODOLOGY

HARDWARE:

• **Piezo transducers:**
A piezoelectric sensor is a device that uses the piezoelectric effect, to measure changes in pressure, acceleration, temperature, strain, or force by converting them to an electrical charge. As pressure is applied on the piezo materials due to feet and hence energy is generated.

Wires: Few wires to connect different parts of the sub system.

• **Soldering Set** :For soldering the piezo materials as per the requirement.

• **Diode-IN4007**:Arranged in the form of bridge rectifier to convert AC to DC.

• **3.3 v Regulator** :Gives a regulated voltage of 3.3 v constantly.

• **Rechargeable Batteries**: Used for storing the electrical energy

Specifications:
• Composition-NiMH
• AA battery
• Output voltage 1.2v

• Required recharging specifications :
-voltage 3.3v

-current 60 mA (not mandatory)

Foam: A foam which is cut in the form of sole.

Double sided Tape: A tape which has stickiness on both of its ends.

Shoes: A Pair of shoes.

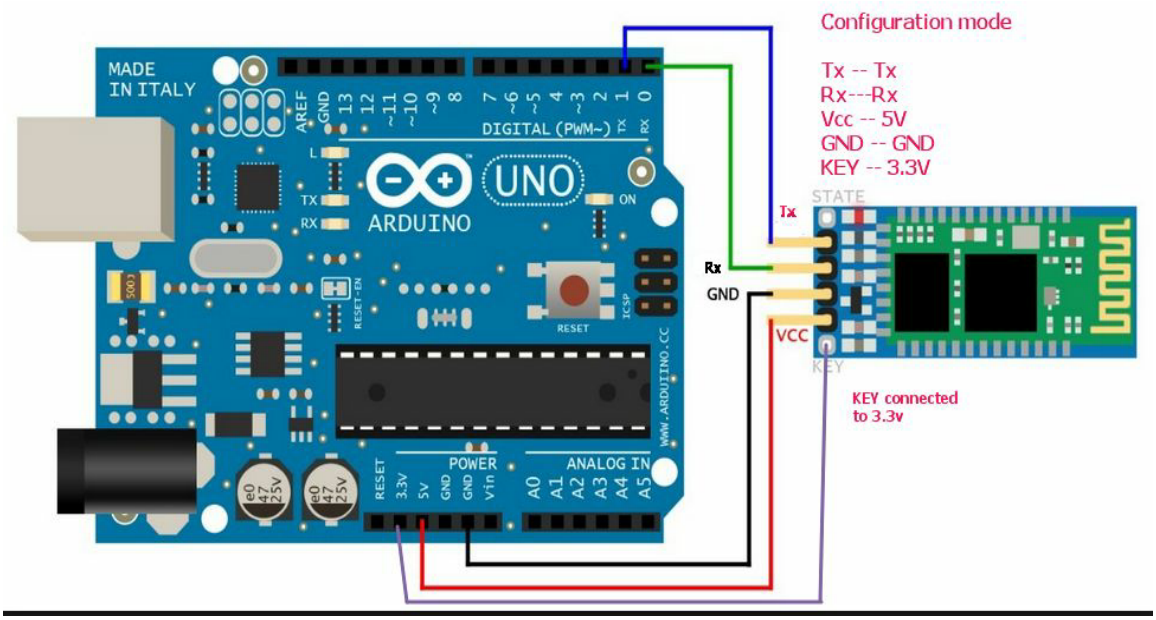
SOFTWARE:

Arduino IDE:

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

Fusion 360:

Fusion 360 is an Autodesk product that is designed to be a powerful 3D Modeling software package with an integrated, parametric, feature based CAM module built into the software. This is a first in the CAD/CAM world.



CHAPTER 5

CONCLUSION

- The design of the proposed energy conservation system for mobile phones and laptop keyboards has been presented in this paper. The design presented here will be quite effective in providing an alternate means of power supply for the mentioned devices during emergency. Further, the approach presented in this paper can be extended to many other applications where there is scope for similar kind of energy conservation.

- By using this project. I can drive D.C loads according to the force I applied on the piezo electric sensor. Although the theory developed in this report justifies the use of switching techniques in efficiently converting that energy to a usable form.
- This project was a great learning to produce electricity in non-conventional ways like from walking.
- Many smaller utility devices can be used through the charged batteries of walk-charger.
- The project gave a scope to improve upon areas like the weight of the shoes,compatibility of the device, & its efficiency.
- Future scopes are there to improve upon to run larger devices.

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