



PIEZOELECTRIC BASED ENERGY HARVESTING USING HUMAN FOOT

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Abstract: The global energy crisis and environmental pollution, which are largely the result of increased consumption of nonrenewable energy sources, have prompted researchers to investigate alternative energy technologies that can harness energy from the environment. Mechanical energy is the most prevalent type of environmental energy that can be captured and converted into usable electrical energy. Due to its high electromechanical coupling and piezoelectric coefficients, piezoelectric transduction is a superior mechanical energy harvesting mechanism when compared to electrostatic, electromagnetic, and triboelectric transduction. The scientific community is thus most interested in piezoelectric energy harvesting. Micro- and nanoscale advancements in materials and manufacturing techniques enable the fabrication of piezoelectric generators with advantageous features such as electromechanical coupling coefficient, piezoelectric coefficient, flexibility, ductility, and integrability for a variety of applications became. Furthermore, as technology in the electronics industry advances, smaller devices with lower power consumption become available on the market. As a result, many electronic devices are expected to be powered by piezoelectric generators in the near future. This white paper provides an in-depth look at the current state of the art in piezoelectric energy harvesting. We review piezoelectric energy conversion principles and describe the working mechanisms and modes of operation of piezoelectric generators. Recent research on inorganic, organic, composite, and bio-inspired natural piezoelectric materials is discussed. Examine nano-, micro-, and mesoscale piezoelectric energy harvesting applications in transportation, structures, air and water applications, intelligent systems, microfluidics, biomedical, wearable and implantable electronics, and tissue regeneration. To do. Advances, limitations, and potential improvements in piezoelectric energy harvesting technology materials and applications are discussed. In summary, this review covers a wide range of piezoelectric materials used in wireless electronics for clean power delivery.

Index Terms – Introduction, Components, Block diagram, Working, Result, References.

I. INTRODUCTION

In recent years, piezoelectric-based energy harvesting has gained popularity as a viable replacement for conventional power sources. One of the most significant advantages of piezoelectric-based energy harvesting is its ability to generate energy from ambient sources, including human movement. The use of piezoelectric materials in shoe inserts, for example, has gained significant attention in recent years due to the potential to generate energy from the mechanical stress generated by human footsteps. In order to be a good candidate for wearable energy harvesting devices, the shoe insert must be comfortable, lightweight, and robust. A suitable environment for the piezoelectric material to create an electrical charge when subjected to mechanical stress is provided by the sandwiching of the material between two layers of flexible material. We will do experiments to gauge the shoe insert's capacity for power production and electrical output. Also, we'll look into how different variables like walking pace, body weight, and shoe type affect how well energy is captured. These tests will provide light on the functionality of the shoe insert and its potential for energy production. It may aid in the creation of sustainable energy sources to create piezoelectric-based energy harvesting based on

the pressure of human feet. We can lessen our reliance on conventional power sources and help to create a future that is more sustainable by capturing the energy produced by human movement.

II. COMPONENTS

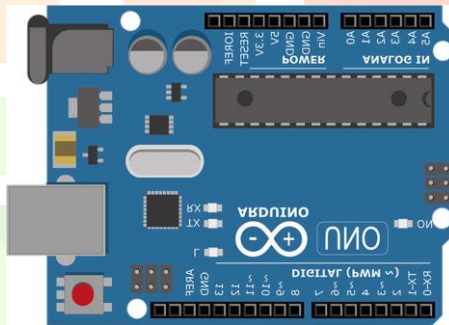
PIEZO ELECTRIC BLOCK:

In piezoelectric actuators, which are machines that can create precise and quick motions with extremely high resolution and precision, piezo blocks are frequently employed as the active component. They can sense little variations in pressure, force, or acceleration and translate them into electrical impulses, making them useful in sensors.



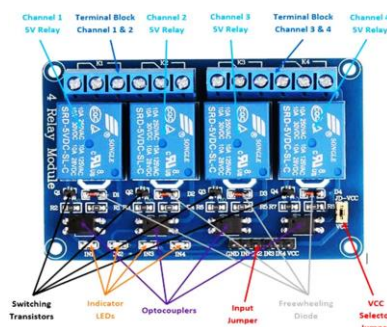
ARDUINO:

Several connections, including USB, Bluetooth, Wi-Fi, and Ethernet, may be made between two Arduino Uno boards in order to utilise them together. Depending on the particular needs of the project, the boards can be programmed separately or one board can serve as a master and the other as a slave. All things considered, Arduino Uno offers a strong and adaptable foundation for electronics projects that need more processing power and capabilities than a single board can offer. Combining two boards allows programmers to build more sophisticated and complicated systems that are capable of carrying out a variety of activities.



4 CHANNEL RELAY:

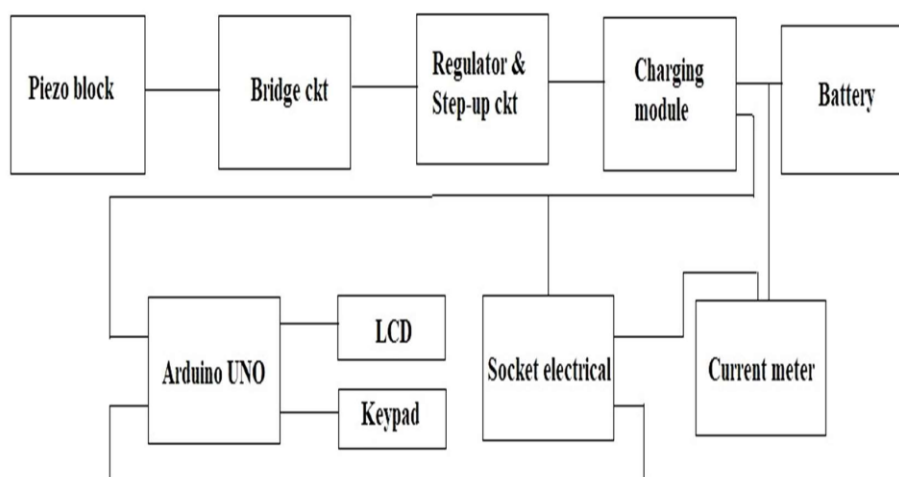
An electronic device such as a computer, microcontroller, or other can supply the control signal for a 4-channel relay. A number of interfaces, including TTL (Transistor Transistor Logic), CMOS (Complementary Metal-Oxide-Semiconductor), and other digital protocols, can be used to deliver the input signal, which is typically a digital signal such as a voltage level or a logic signal. An integral part of many automation and control systems, a 4-channel relay offers a practical and adaptable approach to switch several electrical circuits with a single control signal.



FIBRE GLASS: A form of reinforced plastic material made of very thin glass strands is known as fibreglass, sometimes known as glass fibre. These fibres are either made into mats or woven into a fabric-like material, and the mats or polymer resin-coated mats are then joined together. Because of its various benefits, fibreglass is a preferred material for a wide range of uses. It is robust, long-lasting, and lightweight with a good resistance to heat, chemicals, and corrosion. Moreover, it is neither magnetic nor conductive, making it perfect for use in electrical and electronic applications.



III. BLOCK DIAGRAM:



IV. Working:

Piezoelectric energy harvesting using human foot is a promising technology for generating renewable energy from human movement. In this process, a piezoelectric material is used to convert mechanical stress produced by human footstep into electrical energy. The generated energy can be used to power small electronic devices or recharge batteries. Piezoelectric materials are those that generate an electric charge in response to mechanical stress. This property can be used to generate electricity from a variety of sources, including human movement. When a person steps on a piezoelectric material, it produces a small electric charge, which can be collected and used as a source of energy. There are various piezoelectric materials that can be used for energy harvesting, including lead zirconate titanate (PZT), polyvinylidene fluoride (PVDF), and zinc oxide (ZnO). These materials can be integrated into flooring systems, such as tiles or mats, to harvest energy from human footsteps.

V. RESULT:

Piezoelectric energy harvesting using human foot is a promising technology that has the potential to generate renewable energy from human movement. The technology is based on the use of piezoelectric materials, which can convert mechanical stress produced by human footstep into electrical energy. This energy can be used to power small electronic devices or recharge batteries. The use of piezoelectric energy harvesting is a non-intrusive and passive process that does not require any external power source or maintenance. However, the amount of energy generated by each footstep is relatively small, and multiple piezoelectric elements may be required to generate significant amounts of energy.

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