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SOUND-POWERED PORTABLE CHARGER: THE FUTURE OF ON-THE-GO CHARGING

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Abstract:

Noise is any undesired or unpleasant sound, whereas sound is what we hear and is pleasant to our senses. The sound energy associated with matter vibration is a major cause of noise pollution. Most people dismiss noise as the least of all sorts of pollution to recycle and repurpose into any helpful source. A gadget that uses undesired sound and converts it into electricity. The device's efficacy in terms of charging the power bank by exploiting noise has been proven efficient. The charging rate is particularly rapid in areas with high levels of noise. When compared to commercial power banks, the noise pollution-based power bank is more effective and efficient. Noise is any undesired or unpleasant sound that we hear. The sound energy associated with the vibrating of materials is a major cause of noise pollution. Noise is the least of all sorts of pollution that most people ignore in order to recycle and change into any beneficial source.

The goal of this project is to design and construct a system that can generate useable energy from noise, referred to as noise pollution based power banks, using appropriate architectural design, component design, code generation, and integration system. The received signal is amplified using energy and a transformer. The electromagnetic induction concept is employed to convert noise vibrations into electrical energy, and a transformer is used to boost the received signal. The goal of this project is to design and construct a system that can generate useable energy from noise, referred to as noise pollution based power banks, using appropriate architectural design, component design, code generation, and integration system.

This project aims to create a gadget that can transform undesired sound into power. The device's efficacy in terms of charging the power bank by exploiting noise has been proven efficient. The charging rate is particularly rapid in areas with high levels of noise. When compared to commercial power banks, the noise pollution-based power bank is more effective and efficient. This may be accomplished by utilizing a transducer, which converts noise-induced vibrations into electrical energy. A speaker and a

transformer are employed in the already suggested application to convert noise produced by an automobile horn into electrical energy. The electromagnetic induction concept is utilized to turn noise vibrations into electrical signals. The received signal is amplified using energy and a transformer.

Keywords – ARDUINO ANOMIC SENSOR, VOLTAGE SENSOR, MOBILE CHARGER

1. INTRODUCTION

Sound is a type of energy produced by the back and forth movement of molecules. Noise is any undesired or unpleasant sound, whereas sound is what we hear and is pleasant to our senses. Machines, loud music, construction, electrical generators, automobiles, and other sources of noise are important sources of noise globally. Environmental contamination is one of the most important worldwide concerns. It is the unfavorable modification of our environment, mostly as a result of our activities, as a result of direct or indirect consequences of changes in the energy pattern, radiation levels, and other factors.

Noise pollution is a significant contributor. The least amount of pollution that most people fail to recycle and convert into any beneficial source. Sound is a type of energy produced by the back and forth motion of molecules. Sound is what we hear and enjoy hearing, but noise is any undesired or unpleasant sound. Machines, loud music, and other sources of noise are the primary sources of noise globally. Construction, electrical generators, automobiles, and other things. Environmental contamination is one of the most important worldwide concerns. It is the adverse transformation of our environment, largely as a \sbyproduct of our behaviours, through direct or indirect consequences of the changes in the energy pattern, radiation levels and more. Noise pollution is a significant contributor. Noise is the least of all sorts of pollution that most people fail to recycle and convert into any helpful source.

This project demonstrates how to generate electrical energy from sound waves. There are several methods for generating alternative energy from sound energy, with the piezoelectric crystal serving as the major source of electrical energy in the Noise pollution-based power bank. When mechanical strain is applied to this crystal, it creates electric charges on its surface, and pressure and sound are translated in the same way, as sound is in the form of vibrations that will be gathered on the piezoelectric material and turned into energy. Piezoelectric materials increase the proponent's desire to conceive of a way to utilise noise pollution as an environmental threat and how this sort of waste required recycling to be a valuable material for it is accessible .

2. LITERATURE SURVEY

[1] This paper presents the characteristic of piezoelectric for sound wave energy harvester. The sound level on piezoelectric is experimented at range of 35-100 dB. This range is comparable with ambience environmental human sound of level 50-100 dB.

[2] Piezoelectric materials have the ability to provide desired transformation from mechanical to electrical energy and vice versa. When a mechanical force is applied to the piezoelectric material an electrical voltage is generated and when an electrical voltage is applied to the piezoelectric material it gets strained or mechanically deformed.

[3] The design, fabrication, and characterization of a novel low-frequency meandering piezoelectric vibration energy harvester is presented. The energy harvester is designed for sensor node applications where the node targets a width-tolength aspect ratio close to 1:1 while simultaneously achieving a low resonant frequency.

[4] This paper presents a piezoelectric energy harvester (PEH) to convert vibrations to electrical power. A unimorph cantilever beam is used to generate voltage on piezoelectric material bonded close to the anchor of the cantilever beam. A 4.85 x 1 x 0.04 cm structural layer with piezoelectric material yields peak-to-peak voltage of 64 V at the resonance frequency of the structure

[5] This paper reviews energy harvesting technology from mechanical vibration. Recent advances on ultralow power portable electronic devices and wireless sensor network require limitless battery life for better performance. People searched for permanent portable power sources for advanced electronic devices. Energy is everywhere around us and the most important part in energy harvesting is energy transducer . A great amount of researches have been conducted to develop simple and efficient energy harvesting devices from vibration by using piezoelectric materials. Representative piezoelectric materials can be categorized into piezoceramics and piezopolymers.

[6] In this paper, three different ac-dc converter circuits are compared that can be used as energy harvesting circuits from piezoelectric sources, like periodic mechanical vibration of piezomaterial cantilever beam, and used to supply voltage to charge battery energy storage devices. The study in particular investigates the effect of introducing the third and fifth harmonics along with the fundamental input on the output voltage, current and power delivered to the load.

[7] Energy harvesting has become an increasingly important topic thanks to the advantages in renewability and environmental friendliness. In this paper, a comprehensive study on contemporary portable wind energy harvesters has been conducted. The electrical power generation methods of portable wind energy harvesters are surveyed in three major groups, piezoelectric-, electromagnetic-, and electrostatic-based generators.

[8] This paper demonstrates the possibility of harvesting wind energy using piezoelectric material. The energy collected is made possible by a proposed new topology called the Stacked Buck converter. The new topology is derived from a standard buck topology but allows for sourcing from multiple inputs either independently or simultaneously. The purpose of this topology is to take advantage of several sources of energy harvesting using piezoelectric wind harvesting.

[9] Sensor networks with battery-powered nodes can seldom simultaneously meet the design goals of lifetime, cost, sensing reliability and sensing and transmission coverage. Energy-harvesting, converting ambient energy to electrical energy, has emerged as an alternative to power sensor nodes. By exploiting recharge opportunities and tuning performance parameters based on current and expected energy levels, energy harvesting sensor nodes have the potential to address the conflicting design goals of lifetime and performance.

[10] Micro-fabricated piezoelectric vibration energy harvesters with resonance frequencies of 31–232 Hz are characterized and deployed for testing on ambient vibration sources in the machine room of a large building. A survey of 23 ambient vibration sources in the machine room is presented. A model is developed which uses a discretization method to accept measured arbitrary acceleration data as an input and gives harvester response as output.

3. PROPOSED METHOD

A sound chargeable power bank is a portable device that is capable of storing electrical energy and charging electronic devices, such as smartphones, tablets, and laptops. The unique feature of a sound chargeable power bank is that it has the ability to generate electricity from sound waves. The power bank would contain a piezoelectric material that converts sound waves into electrical energy through the piezoelectric effect. When sound waves enter the power bank, they cause the piezoelectric material to vibrate, producing an electrical charge that can be stored in the power bank's battery. The sound chargeable power bank would be a sustainable and environmentally friendly solution for charging electronic devices, as it would utilize sound energy that is often wasted. It could be especially useful in noisy environments such as concerts, sports events, and public transportation. To use the sound chargeable power bank, the user would simply place it near a sound source, such as a speaker or crowd of people, and the device would start charging. The power bank could also be charged conventionally through a USB port.

4. SOFTWARE DESCRIPTION

4.1 ARDUINO IDE

Open-source software called Arduino IDE enables users to create and upload code in a real-time working environment. It is frequently used by individuals looking for an additional level of redundancy because this code will then be saved on the cloud. Every Arduino software board is entirely compatible with the system. Windows (11, 10, 8.1, 8, 7), Mac, and Linux operating systems all support the Arduino IDE. For simple editing and compilation, the majority of its components are written in JavaScript. Although while writing programs is its main focus, it also has a number of additional features that are noteworthy. It has a way to quickly communicate any information to other project stakeholders.

Users can change internal schematics and layouts as necessary. There are thorough assistance documents that are available and will be beneficial throughout the initial installation procedure. For people who might not have a lot of familiarity with the Arduino framework, tutorials are also accessible.

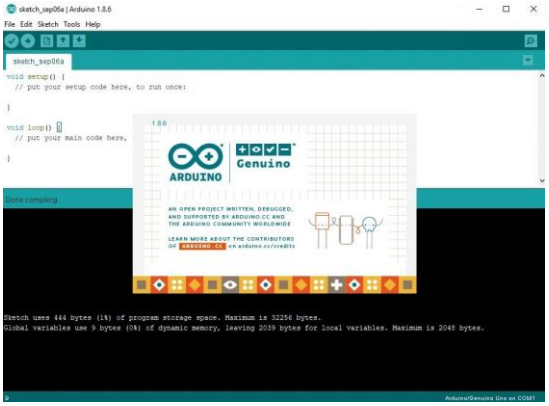

Fig.1. Arduino IDE

4.2 PROTEUS

Proteus VSM fills the void in the design life cycle between schematic capture and PCB layout for embedded engineers. It allows you to build your firmware, apply it to a compatible microcontroller on the schematic, and then simulate the program in tandem with the circuit in a mixed-mode SPICE simulation that takes MCU peripherals into account. Using actuators like switches and buttons as well as on-screen indications like LED and LCD displays, you may interact with the design. Many debugging tools, like as breakpoints, single stepping, and variable display for both assembly code and high level language source, are also available with Proteus VSM.

Proteus VSM creates the environment for design entry and development using our tried-and-true Schematic Capture software. Proteus Schematic is a well-known program that combines sophisticated editing features with ease of use. It has the ability to facilitate schematic capture for PCB design and simulation. Designs submitted to Proteus VSM for testing can be netlisted with our own PCB Design products or with PCB layout software from a third party. In terms of line widths, fill styles, typefaces, and other aspects of drawing aesthetics, ISIS also offers a very high level of customization. When creating the images required for circuit animation, these capabilities are fully utilized.

5. HARDWARE BLOCK DIAGRAM

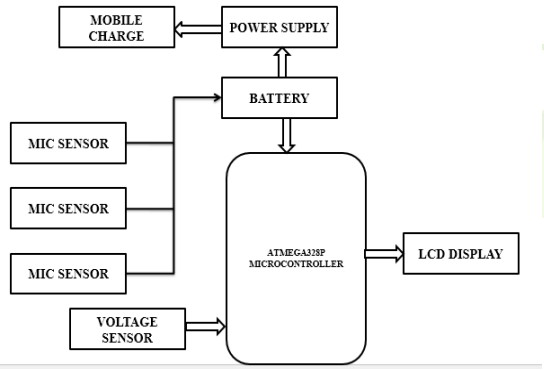

Fig.2. HARDWARE BLOCK DIAGRAM

5.1 HARDWARE EXPLANATION

The goal of this project is to conserve energy from unnecessary sound energy. Sound waves are caught and turned into electrical energy by the mic sensor. The electrical energy is sent to the battery. The battery uses 12V electricity to charge the phone.

6. METHODS

6.1 MODULE LIST

- ARDUINO UNO
- POWER SUPPLY
- MIC SENSOR
- LCD DISPLAY
- BATTERY
- VOLTAGE SENSOR

6.2 MODULE DESCRIPTION

6.2.1 Power Supply

A power supply is a component that provides electricity to at least one load. It usually transfers one sort of electrical power to another, but it may also convert another source of energy - such as solar, mechanical, or chemical - into electrical energy. A power supply gives electric power to components. Often, the word refers to electronics incorporated into the component being powered. Computer power supplies, for example, convert alternating electricity to direct current and are often found in the back of the computer case, along with at least one fan.

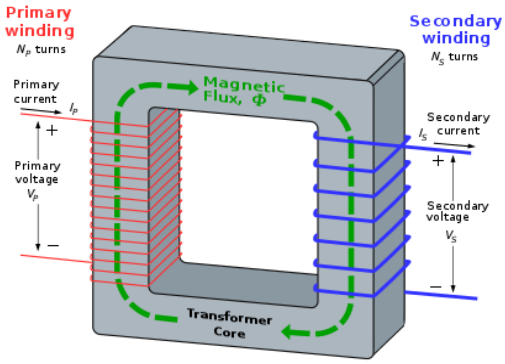

Fig.3. Power Supply

6.2.2 Arduino Uno

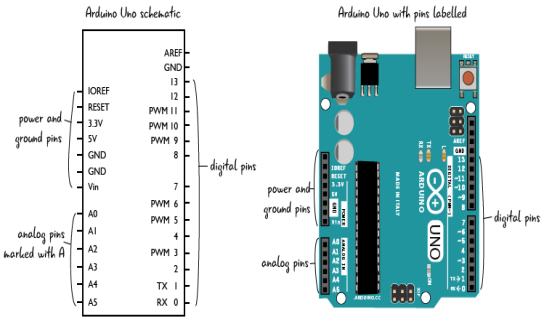

Fig.4. Arduino Uno

The Arduino Uno is an open-source microcontroller board based on the ATmega328P processor. 14 digital I/O pins, 6 analogue inputs, a USB connection, a power connector, an ICSP header, and a reset button are provided. It includes all of the modules required to support the microcontroller. To get started, just connect it to a computer through a USB connection or power it using an adapter. You may explore with your

Arduino without too much concern. In the worst-case situation, you could replace it because the Uno is quite inexpensive compared to other boards.

6.2.3 Voltage sensor

Fig.5.Voltage Sensor

In general, a sensor is an electrical device that detects and responds to a certain sort of signal, such as optical or electrical. The use of sensor techniques in voltage or current measurement has become an excellent alternative for voltage and current measurement methods. Sensors provide several advantages over traditional techniques of measurement, including reduced size and weight, high safety, high precision, nonsaturability, eco-friendliness, and so on. It is possible to combine current and voltage monitoring into a single physical device with small and solid dimensions. This page provides an overview of the voltage sensor and how it works. This sensor measures, calculates, and determines the voltage supply. This sensor can detect the amount of AC or DC voltage. This sensor's input can be voltage, and its output can be switches, analogue voltage signals, current signals, audio signals, and so on.

6.2.4 LCD Display:

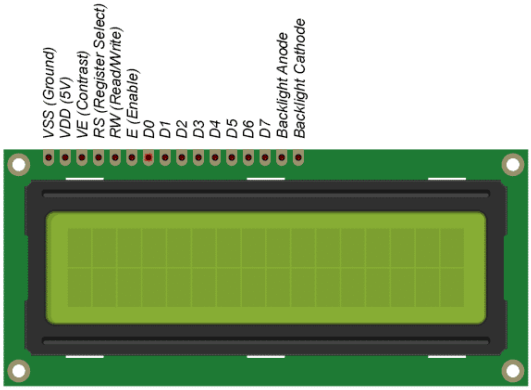

Fig.6. LCD Display

The LCD monitor was released. Despite the fact that liquid crystals were discovered a long time ago, they were first used for a variety of reasons. Under the influence of electricity, liquid crystal molecules may change their orientation and, as a result, the characteristics of the light beam travelling through them. Based on this discovery and further study, it was feasible to establish a link between an increase in electric voltage and a change in the orientation of crystal molecules. LCD panels are made up of microscopic pieces called pixels that may be adjusted to show information. Such displays contain numerous layers, with two panels

composed of sodium-free glass material called substrate playing a critical role. Between them is a thin layer of liquid crystals on the substrate.

6.2.5 Battery

A battery is a type of electric power source that consists of one or more electrochemical cells with external connections that are used to power electrical equipment. While a battery is delivering electricity, the positive terminal is referred to as the cathode, and the negative end is referred to as the anode. The negative terminal is the source of electrons that will flow to the positive terminal through an external electric circuit. When a battery is linked to an external electric load, a redox reaction occurs, converting high-energy reactants to lower-energy products and delivering the free-energy difference to the external circuit as electrical energy. Originally, the term "battery" referred to a device made up of numerous cells; however, the phrase has come to apply to devices made up of a single cell.

Fig.7. Battery

7. ADVANTAGES

- Sustainable and
- Environmentally friendly
- Portable
- Efficient charging
- Useful in noisy environments

8. APPLICATION

- Real-time monitoring of the power bank's battery level, charging status, and remaining capacity.
- Advanced charging algorithms that can optimize the charging process for your specific power bank model.
- The ability to set charging thresholds to ensure that your power bank is not overcharged or undercharged, which can affect its overall lifespan.
- Notifications and alerts when the power bank is fully charged, or if there are any issues with the charging process.

- Integration with other devices, such as smartphones or tablets, to provide additional information about battery usage and charging habits

9. CONCLUSION

The goal of this project is to create an electrical energy generation system using sound energy. The realized system was discovered to gather up noise/sound and convert it to energy after building. Alternatively, the sound energy acquired via a microphone sensor is measured in decibels, and the electrical energy harvested is measured in voltage, therefore a noise pollution-based power bank is an effective device for storing electrical energy derived from sound energy. As a result, sound energy has the potential to be a source of electrical energy.

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