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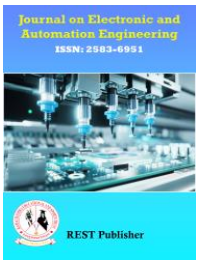


# Solarpiezo Hybrid power charging system

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***Abstract:*** *The solar piezo hybrid power charging system is a remodeling renewable energy solution designed to collect the energy form both solar and mechanical stress & strain to charge electrical devices efficiently. This solar piezo hybrid power charging system integrates a solar panel with piezoelectric sensor to create a hybrid power generation system, this hybrid power generation system ensures frequent energy supply even under low sunlight conditions. The solar panel converts sunlight into electrical energy during the day and piezo sensors generate power from pressure that are sourced from human or mechanical moment. An Arduino Uno microcontroller is a main component of the control system that managing power input, charging, and switching between power sources using slide switches and relay modules by using of solar and mechanical sources the generated energy can be stored in 12v battery, which can be monitored and controlled using LCD display. The system power connected to loads such as LED strip lights, bulbs and a CPU fan. Here, the additional features included i.e., push button switch for manual operations, connector for stable connections, and an inverter if required to supply AC power.*

***Keywords:*** *Arduinouno, LCD, solar panel 9V ,piezo electric sensor, LED strip, battery, inverter, bulb, CPU fan, relay, USB cable, push button switches and slide switch.*

## 1. INTRODUCTION

The solar piezo hybrid power charging system aims to create the energy from naturally i.e., using of solar (sunlight) and piezo electric (mechanical stress and strain). All the natural resources will be finish one day that's why we are trying to implement the solar piezo hybrid power charging system. Increasing of energy demands and environmental conditions we need sustainable and renewable power solutions. In cloudy days' solar panels cannot work efficiently that the results less power generation. To overcome this limitation, hybrid energy system that combine two renewable energy sources that offers a good solution. Here, we are collecting the minutes amount of energy from both (solar and piezo electric) energy resources. Micro energy control technology is based on mechanical vibrations, stress &strain, sun light and human body. These micro energy technologies can be generating the mW or µW levels of power.

This system ensures continuous energy generation by utilizing of solar energy during the day and capturing the mechanical energy through the piezo sensors whenever available. By an Arduino Uno microcontroller, the system efficiently manages energy storage and distribution, providing power to the devices such as bulbs, fans, LED strips and USB cable. This hybrid approach enhances reliability, promotes green energy usage, and ideal for off-grid, rural, or emergency power applications.

## 2. LITERATRESURVEY

**Author: N.G.,&Elvin**

Here the coupled energy harvesting device consists of a primary piezoelectric energy harvesting device to which an electromagnetic component is added to better match the total electrical damping to the mechanical damping in the system. Increased system complexity and higher mechanical losses.

**Author: Hadimani**

She proposes the effectiveness of using a hybrid energy harvesting scheme consisting of AC and DC generators based on piezoelectric and Thermoelectric respectively, for powering a wireless sensor node. heat and vibration, which are ubiquitous from the ambient environment especially those in an oil and gas industries, are being explored, converted and integrated in the form of a hybrid topology in order to increase

the chances of survivability of the wireless sensor node. Limited power generation, making it unsuitable for high-power applications.

**Author: P.Gambier**

He proposed flexible solar cells are coupled with flexible piezoelectric films then the hybrid structure can generate energy from solar radiation, wind and rainfall. Hybrid piezoelectric-photovoltaic devices have been developed which are capable of generating electricity from solar as well as wind and rain energy. Complex material integration and difficulty in large-scale implementation

**Author: Wang,Z.L.**

He proposed a hybrid power generator and storage system using these three sources of energy in order to improve both structural multi-functionality and system-level robustness in energy harvesting. High cost and complexity in system design.

**Author: Bhusari,P.G.**

They proposed the mechanical energy acquisition technology, the development of self-powered sensors, the methods to improve the efficiency of energy acquisition, and the key technical problems of self-powered sensors. Limited energy output, restricting potential applications.

**Authors: S. Priya**

It is a non-transparent hybrid structure which contains copper and aluminium electrodes and eliminates the used of costly indium tin oxide (ITO). Reduced optical efficiency, affecting solar energy absorption. Reduced optical efficiency, affecting solar energy absorption.

**Authors: B.Dudem**

Green energy from the environment is becoming increasingly important as we seek alternative sources of energy to non-renewable sources such as fossil fuels. Lack of practical implementation in large-scale infrastructure.

**Authors: MasoudJavadi**

Then the project was implemented by Masoud Javadi A review of battery technologies used in hybrid renewable systems, including solar and piezoelectric energy sources, with a focus on optimizing charging efficiency. Challenges in optimizing energy storage and balancing multiple energy sources.

## 3. EXISTINGSYSTEM

Current systems mostly depend on single energy source i.e., solar energy. The solar panels are depends on sunlight so the solar panels do not work well at night and cloudy days. Solar panels are widely used to convert sunlight into electrical energy and then stored it to the battery for the later usage. However, these systems face limitations due to the dependency on sunlight. On the other hand, piezo electric harvesting technology, where energy is generating from mechanical vibrations, stress and strain is generally used in small-scale applications and it is rarely integrated into the practical systems due to its low power output. There is no proper hybrid system to integrate multiple energy sources. Switching between sources is done manually and it making the system was less efficiently and less adoptable. So, there is need for smart hybrid systems to combine multiple energy sources for continuous and reliable power.

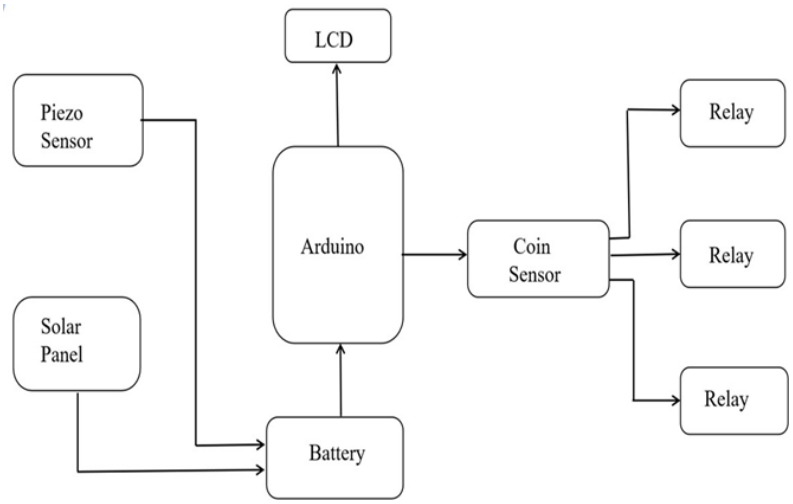


**FIGURE 1.** block diagram of existing system.

## 4. PROPOSEDSYSTEM

The proposed system aims to generate hybrid energy charging by integrating of solar panel and piezoelectric sensor. This can be managed by using of Arduino Uno microcontroller. The system that utilizesasolarpaneltocaptureandconvertelectricalenergyduringthedaytime and piezo electric sensors are experiencing mechanical stress, strain and vibrations (such as footsteps) to generate additional power to the energy generation. Both the energy sources are connected to 12V rechargeable battery for storage. The charging and load control manages through the relays and slide switches.

An LCD display is used to monitor the system parameters such as voltage levels and energy sources. A push button switch that can allows the manual control of operations. And stored energy can be powered various loads including LED strips, CPU fans, bulbs connected through bulb holders and USB cable. An inverter is integrated to convert stored DC power into AC for powering electrical appliances. The system is designed to automatically switch between the energy sources for optimal efficiency, ensuring a stable and sustainable power supply even in the absence of sunlight.

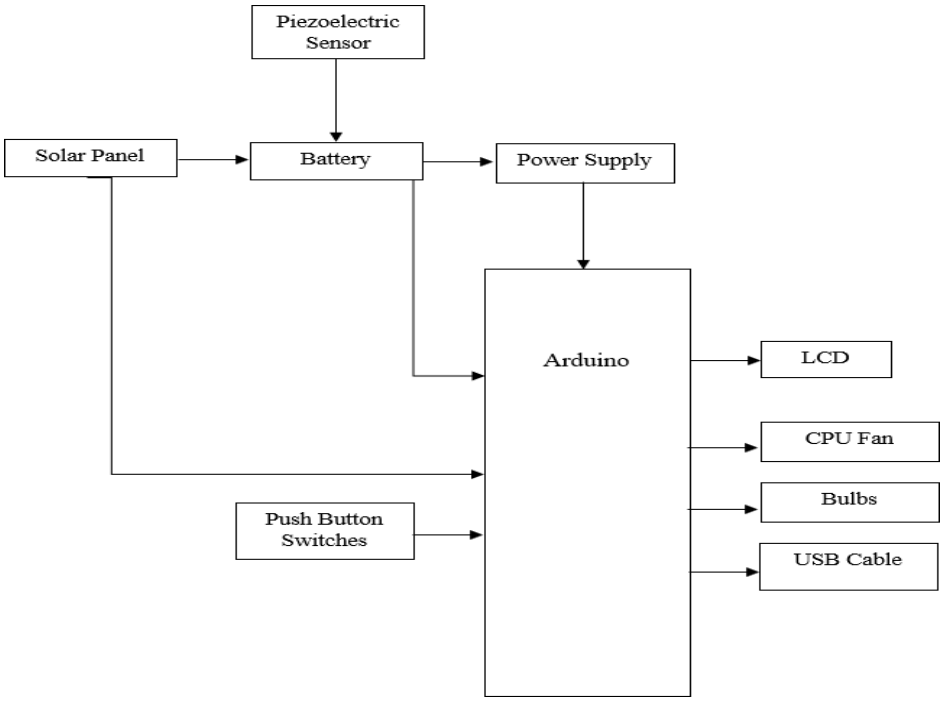


**FIGURE 2.** Proposed system blockdiagram

Here, we are using the software as Arduino IDE and the language we are using as embedded C language. Peron step we have to collect 0.045V of energy, for example, if one person can be rooming 10m of footpath i.e., piezoelectric strip then we are collecting of 1.47636W of power.

**TABLE 1.** casestudy

| | |
|---|---|
| Area covered | 10m |
| Average footfall | 2,500people |
| People stepsonourtails | 80% |
| One step generated | 0.045W |
| Power produced for one hour | 112.5kW/h |
| One house used power per one day | 30-50kW/d |

The solar piezo hybrid power charging system presents a creative and supportable solutions to modern energy

challenges by combining two renewable sources i.e., solar and piezoelectric energy. The hybrid technology ensures the continuous power generation even in the absence of sunlight that time we can utilizing the mechanical stress, strain and vibrations as an alternative energy source. The integration of solar panel and piezoelectric sensor allows to efficient energy management, smart switching between source and real time. monitoring of system performance. The successful implementation of this project, lower energy costs and support eco-friendly. This system especially beneficial in rural areas where reliable electricity is limited, the way for future advancements in clean and hybrid energy technologies.

## 6. RESULT

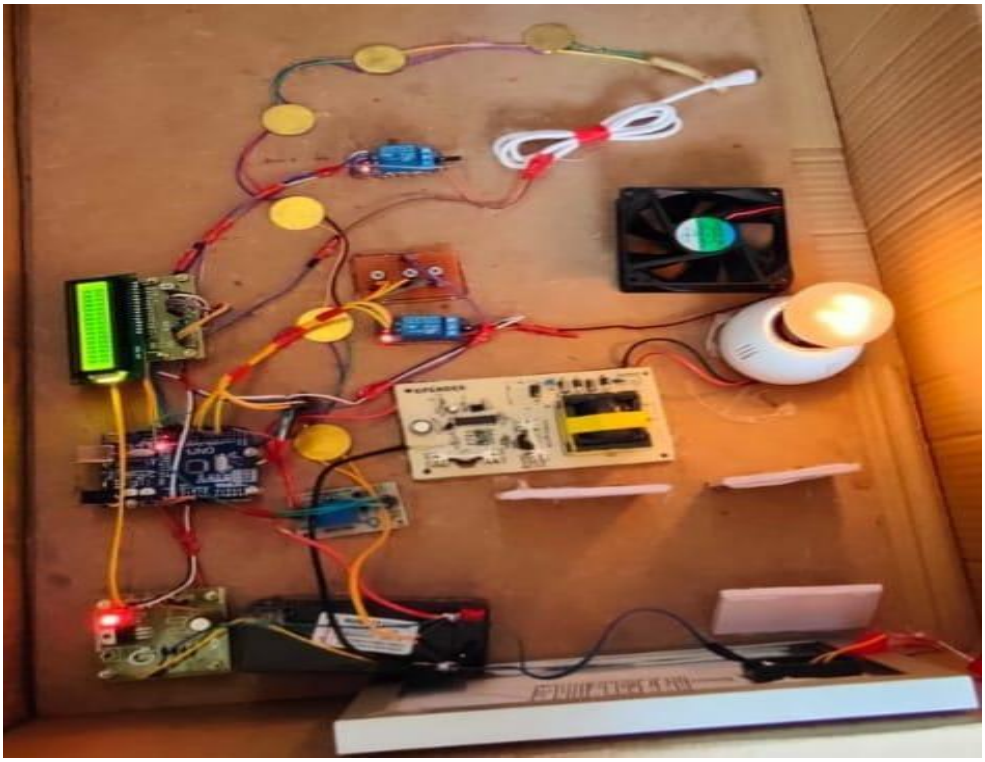

**FIGURE 3.**

## 7. CONCLUSION

The solar piezo hybrid power charging system presents a creative and supportable solutions to modern energy challenges by combining two renewable sources i.e., solar and piezoelectric energy. The hybrid technology ensures the continuous power generation even in the absence of sunlight that time we can utilizing the mechanical stress, strain and vibrations as an alternative energy source. The integration of solar panel and piezoelectric sensor allows to efficient energy management, smart switching between source and real time monitoring of system performance. The successful implementation of this project, lower energy costs and support eco-friendly. This system especially beneficial in rural areas where reliable electricity is limited, the way for future advancements in clean and hybrid energy technologies

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