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Solar Peizo Hybrid Power Charging System

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***Abstract*: The use of renewable resources like the solar energy and various other clean sources of energy has been on an increase in demand in the recent years due to their ease in availability and low and cost. This project demonstrates how to use the solar energy and the kinetic energy from footsteps of people walking over piezo based footboard. The Solar Panel is used to harness the solar power. It converts the solar power into voltage, which when more than the voltage in the battery is able to charge the battery. The power available through the solar panel is sensed by an Arduino family microcontroller which it displays on the LCD. Similarly, the power generated through footsteps over Piezo Footboard is shown on the LCD. In this way one can charge the battery through solar and footstep energies while simultaneously also monitoring of how much is getting generated with the use of Solar Piezo Hybrid Power Charging System.**

***Keywords*: Arduino, battery, LCD, power supply, voltage regulator.**

1. Introduction

Now-a-days, with increasing concern of global warming and the depletion of fossil fuel reserves, many are looking at sustainable energy solutions to preserve the earth for the future generations. Other than hydro power, vibration and photovoltaic energy holds the most potential to meet our energy demands. Alone, vibration energy is capable of supplying large amounts of power but its presence is highly unpredictable as it can be here one moment and gone in another. Similarly, solar energy is present throughout the day but the solar irradiation levels vary due to sun intensity and unpredictable shadows cast by clouds, birds, trees, etc. The common inherent drawback of vibration and photovoltaic systems are their intermittent natures that make them unreliable. When a source is unavailable or insufficient in meeting the load demands, the other energy source can compensate for the difference by combining these two intermittent sources.

2. Hardware Requirements

1) LCD

LCD (Liquid Crystal Display) is the innovation utilized in scratch pad shows and other littler PCs. Like innovation for light-producing diode (LED) and gas-plasma, LCDs permit presentations to be a lot slenderer than innovation for cathode beam tube (CRT). LCDs expend considerably less power than LED shows and gas shows since they work as opposed to emanating it on the guideline of blocking light.

2) Battery

A rechargeable battery is an energy storage device that can be charged again after being discharged by applying DC current to its terminals.

Rechargeable batteries allow for multiple usages from a cell, reducing waste and generally providing a better long-term investment in terms of dollars spent for usable device time. This is true even factoring in the higher purchase price of rechargeable and the requirement for a charger. A rechargeable battery is generally a more sensible and sustainable replacement to one-time use batteries, which generate current through a chemical reaction in which a reactive anode is consumed. The anode in a rechargeable battery gets consumed as well but at a slower rate, allowing for many charges and discharges.

3) 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 ‘presses 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.

4) Solar panel

Photovoltaic solar panels absorb sunlight as a source of energy to generate electricity. A photovoltaic (PV) module is a packaged, connected assembly of typically 6x10 photovoltaic solar cells. Photovoltaic modules constitute the photovoltaic array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications.

The most common application of solar energy collection outside agriculture is solar water heating systems.

3. Software Requirements

1) Arduino IDE

IDE stands for Integrated Development Environment – An

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official software introduced by Arduino.cc, that is mainly used for writing, compiling and uploading the code in the Arduino Device. Almost all Arduino modules are compatible with this software that is an open source and is readily available to install and start compiling the code on the go.

Introduction to Arduino IDE:

- Arduino IDE is an open-source software that is mainly used for writing and compiling the code into the Arduino Module.
- It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process.
- It is easily available for operating systems like MAC, Windows, and Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment.
- A range of Arduino modules available including Arduino uno, Arduino mega, Arduino leonardo, Arduino micro and many more.
- Each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code.
- The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board.
- The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module.
- This environment supports both C and C++ languages.

How to install Arduino IDE:

You can download the Software from Arduino main website. As I said earlier, the software is available for common operating systems like Linux, Windows, and MAX, so make sure you are downloading the correct software version that is easily compatible with your operating system.

- If you aim to download Windows app version, make sure you have Windows 8.1 or Windows 10, as app version is not compatible with Windows 7 or older version of this operating system.

The IDE environment is mainly distributed into three sections,

1. Menu Bar
2. Text Editor
3. Output Pane

Embedded system hardware is built with a microprocessor or microcontroller. The embedded system hardware has elements like input output (I/O) interfaces, user interface, memory and the display. Usually, an embedded system consists of:

- Power Supply
- Processor
- Memory
- Timers

Implementation flow:

Stage 1:

Considering the problems of existing methods and giving solution to that problem by considering the basic requirements for our proposed system

Stage 2:

Considering the hardware requirement for the proposed system

For this we need to select the below components:

1. Microcontroller
2. Inputs for the proposed system (ex: sensors, drivers etc.)
3. Outputs (ex: relays, loads)

Stage 3:

After considering hardware requirements, now we need to check out the software requirements. Based on the microcontroller we select there exists different software for coding, compiling, debugging. we need to write source code for that proposed system based on our requirements and compile, debug the code in that software.

After completing all the requirements of software and hardware we need to bring both together to work our system. For this we need to burn our source code into microcontroller, after burning our source code to microcontroller then connect all input and output modules as per our requirement.

Comparison between ATmega48PA, ATmega88PA, ATmega168PA and ATmega328P:

The ATmega48PA, ATmega88PA, ATmega168PA and ATmega328P differ only in memory sizes, boot loader support, and interrupt vector sizes. Table 2-1 summarizes the different memory and interrupt vector sizes for the three devices.

Table 1
Memory size summary

Device	Flash	EEPROM	RAM	Interrupt Vector Size
ATmega48PA	4K Bytes	256 Bytes	512 Bytes	1 instruction word/vector
ATmega88PA	8K Bytes	512 Bytes	1K Bytes	1 instruction word/vector
ATmega168PA	16K Bytes	512 Bytes	1K Bytes	2 instruction words/vector
ATmega328P	32K Bytes	1K Bytes	2K Bytes	2 instruction words/vector

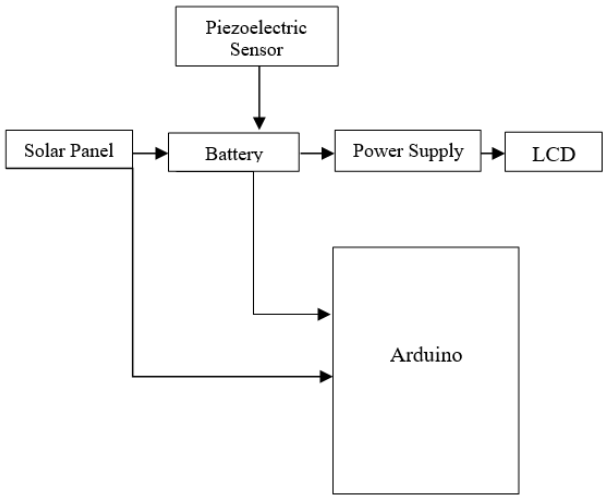

Fig. 1. System block diagram

Advantages:

- Simply walking on the step, it generates power.
- No need fuel input.
- This is a non-conventional system.
- The battery is used to store the generated power.

Applications:

- Mobile charging
- Street lighting
- Bus station lighting
- Emergency power failure stations
- Rural areas

4. Conclusion

This technique for generation of power is extremely prudent and is anything but easy to produce. It can be utilized as a part of Rural zones additionally where accessibility of power is less or exceptionally low. It can be utilized to drive DC load. In developing nation like India, we can utilize this strategy for power generation with a specific end goal to uncover the heaps from Renewable and non-Renewable wellspring of energy.

References

[1] Jaydev Ghosh, Supratim Sen, Amit Saha, Sameer Basak "Electrical Power Generation Using Foot Step for Urban Area Energy Applications," 2013 International Conference on Advances in Computing, Communications, and Informatics (ICACCI).

[2] Prabaharan R, Jayramaprakash A, Vijay Anand, "Power Harvesting by Using Human Foot Step," International Journal of Innovative Research in Science Engineering and Technology, vol. 2, no. 7, July 2013.

[3] Ramesh Raja R, Sherin Mathew."Power Generation from Staircase (steps)," International Journal of Innovative Research in Science Engineering and Technology, vol. 3, no. 1, February 2014.

[4] Itika Tandon, Alok Kumar, "A Unique Step towards Generation of Electricity via New Methodology," International Journal of Advanced Research in Computer and Communication Engineering, vol. 3, no. 10, October 2014.

[5] T. R. Deshmukh, "Design and analysis of a Mechanical Device to harvest energy from human footstep motion,", Volume 3, Special Issue 1, ICSTSD 2016.

[6] M. Young, The Technical Writer's Handbook. Mill Valley, CA: University Science, 1989.

[7] Vipin Kumar Yadav, Vivek Kumar Yadav, Rajat Kumar, and Ajay Yadav, "Power generation through step,"

[8] Shiraz Afzal and Farrukhhafeez, "Power Generation Footstep."

[9] Sasankshekhar Panda, An Investigation on Generation of Electricity Using Foot Step."

[10] Jose Ananth Vino, "Power Generation Using Foot Step," International Journal of Engineering Trends and Technology, vol. 1, no. 2 May 2011.