



RFID Based Advanced Foot Step Power Generation using Arduino UNO

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ABSTRACT: The footstep Power generation and its use is one of the issues. Now-a- days numbers of power sources are present, non-renewable & renewable, but still we can't overcome our power needs. Among these human population is one of the resources. In this project we are doing generation of power by walking or running. Power can be generated by walking on the stairs. The generated power will be stored and then we can use it for domestic purpose. This system can be installed at homes, schools, colleges, where the people move around the clock. When people walk on the steps or that of platform, power is generated by using weight of person. The control mechanism carries piezoelectric sensor, this mechanical energy applied on the crystal into electrical energy. When there is some vibrations, stress or straining force exert by foot on flat platform. This output is provided to our monitoring circuitry which is micro controller-based circuit that allow user to monitor the voltage and charges a battery, and this power source has many applications. The project model is cost effective and easy to implement.

KEYWORDS: Arduino uno, RFID sensor, piezoelectric sensors, LCD, Relay.

I. INTRODUCTION

Energy is nothing but the ability to do the work. In day to day life, Electricity is most commonly used energy resource. Now-adays energy demand is increasing and which is life-line for people. Due to this number of energy resources are generated and wasted. Electricity can be generated from resources like water, wind etc. to generate the electricity from these resources development of big plants is needed having high maintenance cost. Some other energy resources are also costly and cause pollution. They are not affordable to common people. Electricity has become important resources for human being hence, it is needed that wasted energy must have to utilize, walking is the most common activity done by human being while walking energy is wasted in the form of vibration to the surface. And this wasted energy can be converted into electricity. Using the principle called piezoelectric effect. Piezoelectric effect is the effect in which mechanical vibrations. Pressure or strain applied to piezoelectric material is converted into electrical form.

This project gives idea about how energy is used on stepping on stairs. The use of stairs in every building is increasing day by day even small building has some floors when we are stepping amount of this wasted energy is utilized and converted to electricity by Piezoelectric effect. Piezoelectric effect is the effect of specific materials to generate an electric charge in response to applied mechanical stress. From this system we are generating energy by human footsteps using the piezoelectric effect. Piezoelectric effect is the effect which converts mechanical stress, strain, pressure into electrical energy. This idea not only overcome the energy crises problem but also helps to maintain the eco- friendly environment for generating energy. When we stored power in battery then we want to use this power so that we are here using RFID security system

II. STUDY OF CONNECTION

To give better voltage and current three PZT are connected in series. A force sensor and voltmeter is connected to this series combination. As varying forces are applied on this connection and corresponding voltages are noted. Voltage and current generated across the series connection are measured. The voltage and current generated across the parallel connection are measured. From series connection obtained current is poor and from parallel connection obtained voltage is poor. To overcome this problem rectifier in series-parallel connection is used. This dc power is stores in storing battery and this storing Battery is connected to the Relay Switch. This switch provides a path from storing battery to our application. Our application is to charge a phone. Here we are also using Arduino Uno, LCD and RFID sensors. Arduino is open source electronic prototyping platform based on flexible, easy to use hardware and software. RFID is a wireless communication technology working on radio frequency radio waves .it is used to identify the object or track the objects.

III. WORKING

Piezoelectric material converts pressure into electrical energy. The pressure can be either from weight of moving vehicles or from the weight of people walking on it. The produced output is in the variable form .so bridge rectifier circuit is used to convert variable voltage into linear voltage. An AC filter is used to filter out this output voltage and it is stored in rechargeable battery. We are using Arduino uno. Arduino is open source electronic prototyping platform based on flexible, easy to use hardware and software. When system is on it display a message on LCD then it is RFID based security system allows only authorized people to use this system. Here we are using RFID TAGS. These are comprising a microchip containing identifying information and an antenna that transmits this data wirelessly to the reader. RFID READER is active device that is used to read information stored in tags or transmit information to the Arduino. it's consists of an antenna either internal or external which continuously emits radio wavesso that RFID tag can respond to it by sending back their information. This information is generally known as electronic product code (EPC). After that this system give time slot to user the charge phone. The time slot is it display on the LCD at the same time Arduino turn on Relay switch and it makes path between storage battery our application after finishing time slot. Arduino turn off the Relay switch there is disconnection between battery and application. From this system we are generating energy by human footsteps using the piezoelectric effect. Piezoelectric effect is the effect which coverts mechanical stress, stain, pressure into electrical energy. This idea not only overcome the energy crises problem but also helps to maintain the eco- friendly environment for generating energy.

IV. DESIGN AND IMPLEMENTATION

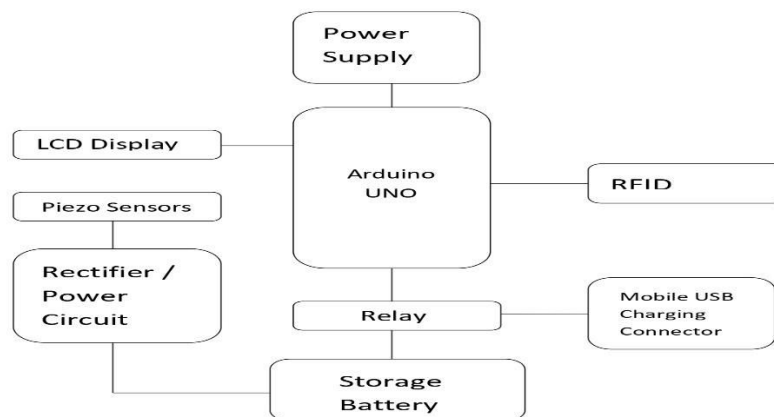


Fig.1: Block Diagram of the Project

V. ELECTRONIC PARTS

1.Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

2.LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily

programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Click to learn more about internal structure of a LCD.

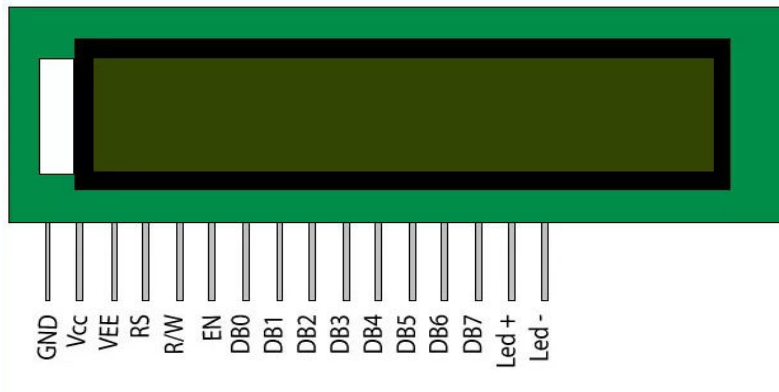


Fig.2: Liquid Crystal Display

3. Piezoelectric Sensor

A Piezoelectric Sensor requires no external voltage or current source, they are able to generate an output signal from the strain applied. This makes them a popular choice for many applications. Piezoelectric sensors are used in a variety of applications through different industries as they are so diverse.

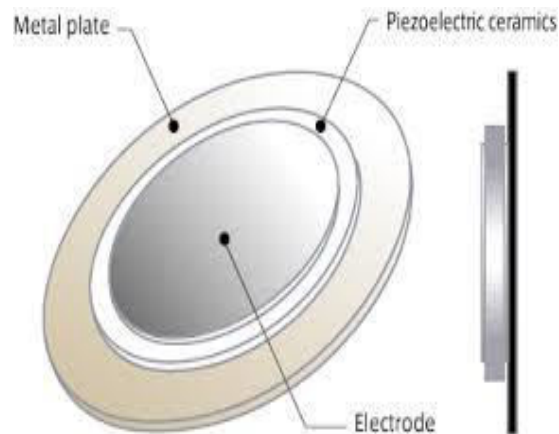


Fig.3: Piezoelectric Sensor

4. Relay Switch

Relays are most commonly used switching device in electronics. Let us learn how to use one in our circuits based on the requirement of our project. One is the Trigger Voltage; this is the voltage required to turn on the relay that is to change the contact from Common->NC to Common->NO. Our relay here has 5V trigger voltage, but you can also find relays of values 3V, 6V and even 12V so select one based on the available voltage in your project. The other parameter is your Load Voltage & Current, this is the amount of voltage or current that the NC,NO or Common terminal of the relay could withstand, in our case for DC it is maximum of 30V and 10A. Make sure the load you are using falls into this range.



Fig.4: Relay Switch

5.RFID Reader and RFID Tag

EM18 RFID Reader is a module which reads the ID information stored in RFID TAGS. This ID information is unique for every TAG which cannot be copied. EM-18 is used like any other sensor module. First, we choose the mode of communication between MODULE and CONTROLLER. Next, we will program the controller to receive data from module to display. Next power the system. When a tag is brought near the MODULE it reads the ID and sends the information to controller. The controller receives the information and performs action programmed by us.

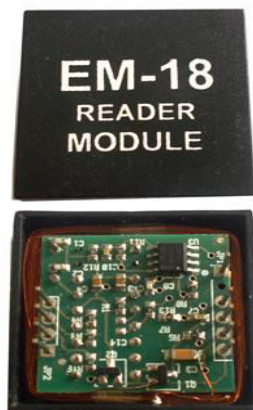


Fig.5: RFID Reader and RFID Tag

6.BC548 Transistor

BC548 is a NPN transistor so the collector and emitter will be left open (Reverse biased) when the base pin is held at ground and will be closed (Forward biased) when a signal is provided to base pin. BC548 has a gain value of 110 to 800, this value determines the amplification capacity of the transistor. The maximum amount of current that could flow through the Collector pin is 500mA, hence we cannot connect loads that consume more than 500mA using this transistor. To bias a transistor, we have to supply current to base pin, this current (I_B) should be limited to 5mA.



Fig.6: BC548 Transistor



VI. CONCLUSION

The project “FOOT STEP POWER GENERATION USING PIEZO SENSORS WITH RFID” is successfully tested and implemented which is the best economical, affordable energy solution to common people. This can be used for many applications in rural areas where power availability is less or totally absence As India is a developing country where energy management is a big challenge for a huge population. By using this project, we can drive both AC and DC loads according to the force we applied on the Piezoelectric sensor.

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