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FOOTSTEP POWER GENERATION USING MICROCONTROLLER

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Abstract : In this paper, we have presented the design of power generation using footstep based on available piezoelectric sensors. Human race requires energy at very rapid rate for their living and wellbeing from the time of their arrival on this planet, because of this reason power resources have been worn out and enervated. Proposal for the employment an application of extravagant energy in foots of human is very much to the purpose for extremely populated nations like China and India. Where the streets, rail and bus station are over peopled and packed like sardines moving around the clock. So, using such concept the power can be availed and deployed by converting mechanical energy to electrical energy. Whenever force is applied on piezoelectric sensor, then the force is converted into electrical energy. In that movement, the output voltage is stored in the battery. The output voltage which is generated from the sensor is used to drive DC loads Whenever force is applied on piezoelectric sensor, then the force is converted into electrical energy. the battery. The output voltage which is generated from the sensor is used to drive DC loads Here we are using AT89S52 to display the amount of battery get charged.

Keywords– PiezoelectricSensor, Microcontroller, LCD Panel, Battery

I. Introduction

Day by day, the population of the country increased and the requirement of the power is also increased. At the same time the wastage of energy also increased in many ways. So reforming this energy back to usable form is the major solution. As technology is developed and the use of gadgets, electronic devices also increased.Power generation using conservative methods becoming deficient. There is a necessity arises for a different power generation method. At the same time the energy is wasted due to human locomotion and many ways. To overcome this problem, the energy wastage can be converted to usable form using the piezoelectric sensor. This sensor converts the pressure on it to a voltage. So by using this energy saving method, that is the footstep power generation system we are generating power.

This project is used to generate voltage using footstep force. The proposed system works as a medium to generate power using force. This project is very useful in public places like bus stands, theaters, railway stations, shopping malls, etc. So, these systems are placed in public places where people walk and they have to travel on this system to get through the entrance or exists.

II. Literature Review

G. Dhanalakshmi presents Footstep Power Generation System with the help of piezo transducers. This type of system is useful at public places like railway stations. Figure 1 showthe hardware setup of proposed system, which consists of ARDUINOUNO (a microcontroller board based onthe ATmega328), Piezoelectric Crystal Material (group offerroelectric materials, which made upof crystals and has polar character without an electricfield being applied), Relay(is used open and close circuitselectromechanically), Inverter(convert thedirect current (DC) to the alternating current (AC)), and MOSFET Driver (large amount of chargeto drive the voltage up and down).When pressure appliedto the piezo-electric materialconvert it into electrical energy, but this energy is Variablevoltageand is converted into a linear voltageby using the Bridge circuit.If any fluctuations in output AC ripple filter is used to filter is used and is stored in a rechargeable battery.

Mr. A. Adhithan proposed the power generation through footsteps as a source of renewable energy system. In this proposed system, generating of additional power by the heat and this obtained by the load using the peltier effect. The main purpose of the system is to charge battery through DC voltage.

The advantages of all above system discussed in exiting work provide the following advantages

- By walking or running Power generation is done
- Does not require any type of fuel.

•Very conventional system.

•Battery is required to store the generated electricity

.•Renewable source of energy

.•Saves agricultural land.

•No Environment pollution No smoke or ash or any toxic chemical is produced

III. Block diagram:

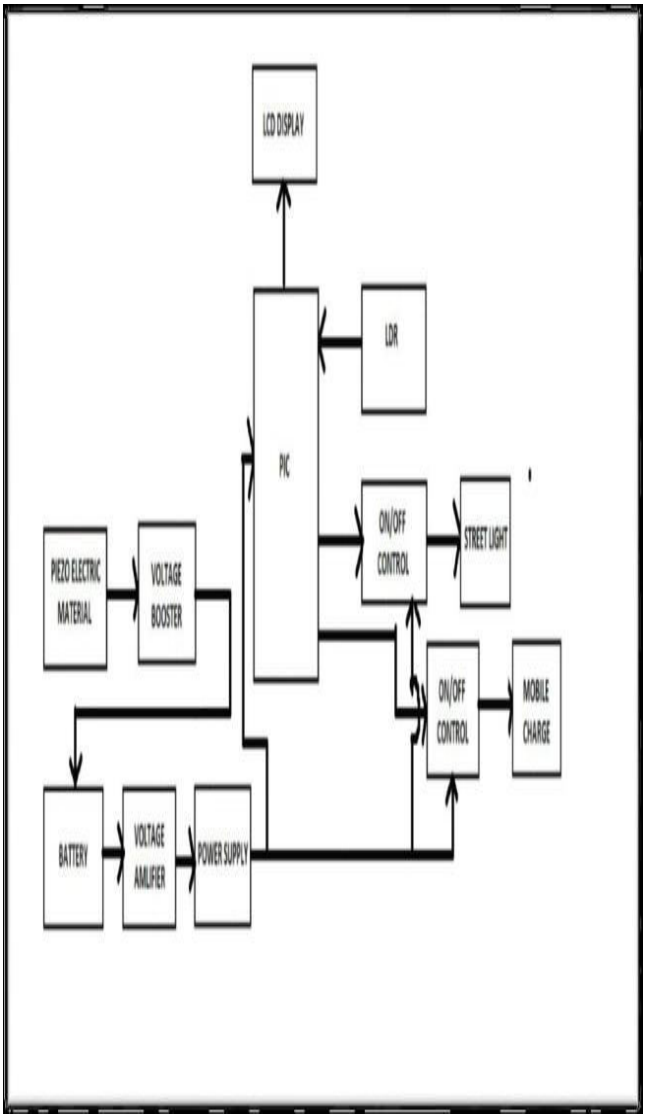

Fig.1 Block Diagram

IV. Sensors Used:

1. ATmega328 Microcontroller

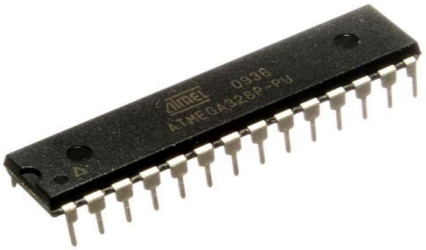

Fig. 2 ATmega328 Microcontroller

The ATmega328 is a single-chip microcontroller created by Atmel in the megaAVR family (later Microchip Technology acquired Atmel in 2016). It has a modified Harvard architecture 8-bit RISC processor core.
The Atmel 8-bit AVR RISC-based microcontroller combines 32 KB ISP flash memory with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages),
programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per MHz.The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM con-tents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

2. Piezoelectric Sensor

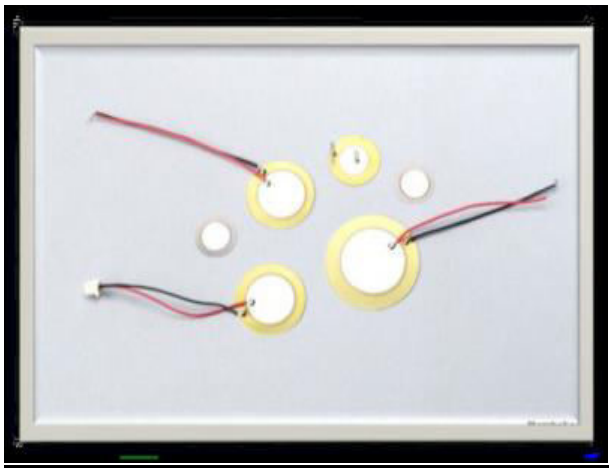

Fig. 3Piezoeletric sensor

A piezoelectric sensor is an electric device which is used to measure acceleration, pressure, or force to convert them to an electric signal. These sensors are mainly used for process control, quality assurance, research and development in various industries. The applications of this sensor involve, aerospace, medical, nuclear instrumentation, and as a pressure sensor it is used in the touch pad of mobile phones. In the automotive industry, these sensors are used to monitor ignition when developing internal burning engines.

3. Voltage Booster:

A boost converter (step-up converter) is a DC-to-DC power converter that steps up voltage (while stepping down current) from its input (supply) to its output (load). It is a class of switched-mode power supply (SMPS) containing at least two semiconductors (a diode and a transistor) and at least one energy storage element: a capacitor, inductor, or the two in combination. To reduce voltage ripple, filters made of capacitors (sometimes in combination with inductors) are normally added to such a converter's output (load-side filter) and input

4. 16×2 LCD

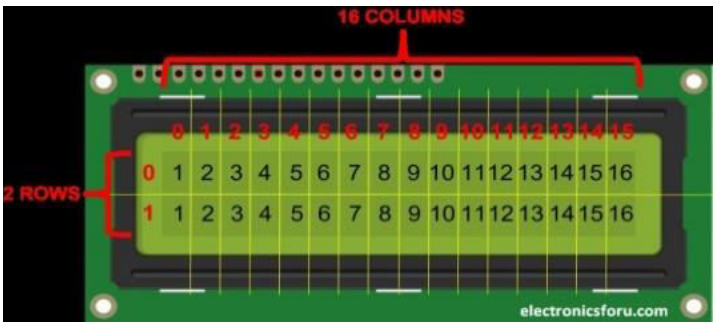

Fig. 4 16×2 LCD

- An **LCD** is an electronic display module which uses **liquid crystal** to produce a visible image. The **16×2 LCD** display is a very basic module commonly used in DIYs and circuits. The **16×2** translates o a display **16** characters per line in **2** such lines. In this **LCD** each character is displayed in a 5×7 pixel matrix.
- Flat screen **LCD** and plasma screens **work** in a completely different way. ... In a plasma **screen**, each pixel is a tiny fluorescent lamp switched on or off electronically. In an **LCD** television, the pixels are switched on or off electronically using liquid crystals to rotate polarized light.

5. Lead Acid Battery

Fig. 5 Lead Acid Battery

- A typical **lead–acid battery** contains a mixture with varying concentrations of water and **acid**. Sulfuric **acid** has a higher density than water, which causes the **acid** formed at the plates during charging to flow downward and collect at the bottom of the **battery**.
- The optimum operating temperature for the **lead-acid battery** is 25*C (77*F). Elevated temperature reduces longevity. As a guideline, every 8°C (15°F) rise in temperature cuts the **battery** life in half. A VRLA, which would **last** for 10 years at 25°C (77°F), would only be good for 5 years if operated at 33°C (92°F).

6. ADC

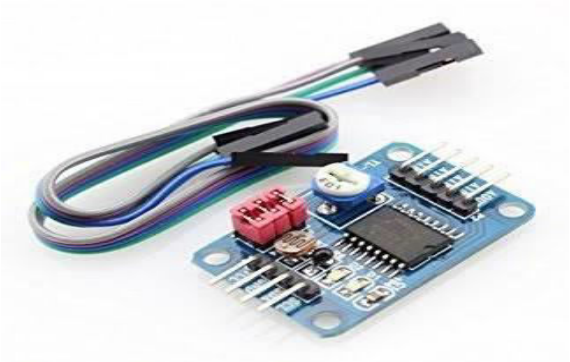

Fig. 6 ADC

- In electronics,an **analog-to-digital converter** (**ADC**, **A/D**, or **A-to-D**) is a system that

converts an analog signal, such as a sound picked up by a microphone or light entering a digital camera, into a digital signal. An ADC may also provide an isolated measurement such as an electronic device that converts an input analog voltage or current to a digital number representing the magnitude of the voltage or current. Typically the digital output is a two's complement binary number that is proportional to the input, but there are other possibilities.

- There are several ADC architectures. Due to the complexity and the need for precisely matched components, all but the most specialized ADCs are implemented as integrated circuits (ICs).
- A digital-to-analog converter (DAC) performs the reverse function; it converts a digital signal into an analog signal.

V. WORKING:

In this paper a substitute strategy for generation of power is finished by utilizing piezo plate. In this framework shown in fig when a power connected on the piezo plate the state of the piezo plate changes which prompts the generation of voltage. Piezo electric impact is depicted as a straight electromechanical collaboration between the mechanical and the electrical state in crystalline materials with no reversal symmetry.

In this foot step power generation project is designed to convert foot step, walking and running energy into electrical energy. It is used to generate electricity from by walking or running on foot step. The demand of electrical energy is increasing day by day. But power generation conventional resources are now not enough for total demand of electrical energy. Therefore many researchers and engineers are working on non conventional ways of electrical power generation. Foot step power generation system is also a non conventional electrical energy production system. It converts mechanical energy of foot steps into electrical energy by using transducers. This power generation system can become very popular among populated countries like Pakistan, china, India. It can be implemented on roads, bus stations and many public places. Although this system is little bit expensive, but it can make a huge difference in electrical power generation of country.

Foot step power generation system basically converts force energy of foot into electrical energy by using piezoelectric sensor. Piezoelectric sensor is transducer which converts force energy into electrical energy. I will discuss it in more detail in later part of this article.

Foot step power generation system working

Working of footstep power generation system consists of following main points:

- Piezoelectric sensor interfaced with microcontroller and used as a transducer to convert force energy into electrical energy
- It is consists of large number of Piezoelectric sensors connected in series. Kinetic energy of series connected transducers is converted into electrical energy.
- Voltages generated by piezoelectric sensors are feed to circuit elements to get proper output.
- Output energy is stored in batteries.

With application of force on piezoelectric transducer, its converts force into electrical energy. AC ripple neutralizer controls the fluctuation in generated voltages and unidirectional current controller controls the battery charging current with the help of pic16f877A pic microcontroller. The voltage generated by series of sensors is stored in Lead Acid batteries. This voltage can be used to drive either DC or AC loads. For AC loads**,** pure sine wave inverter circuit is used. Inverter converts dc voltages stored in lead acid batteries in 220 volt AC. AC voltage can be used to drive AC loads. User can use any type of inverter according to his/her requirement like pure sine wave inverter, square wave inverter and modified sine wave inverter. Rating of battery charger also depends on amount of power generation from foot step and microcontroller displays the amount of battery charging.

VI. APPLICATIONS:

This type of system is applicable in different areas; following are some example -

- Mobile charging
- Bus station
- School and colleges
- Cinema hall
- Shopping

VII. CONCLUSION:

- Demand of electricity is increasing day by day because of increase of human population, and it becomes the basic need of human life. In this paper a new era of power generation is given i.e. Foot Step Power Generation, 88th in which human walking or running is used to generate the electricity.
- This paper provides the overview of Foot Step Power Generation system also provides the advantages and application of this system.
- 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 both AC and in addition 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.

VIII. FUTURE SCOPE:

Utilization of wasted energy is very much relevant and important for highly populated countries in future.

1. Flooring Tiles-
Japan has already started experimenting the use ofpiezoelectric effect for energy generation. They implementpiezoelectric effect on the walking tiles. Thus every timepeople steps on the tiles; they trigger a small vibration thatcanbestoredenergy.
The flooring tiles are made up of rubber which canabsorb the vibration. This vibration generates when peopleare 0walking on it.Under 0these0 tiles piezoelectric materialare placed. When the movement is felt by the material theycan 0generate the electricity. This generated energy iscontinually stored into the battery. Generated electricity wecan use the lightning of lamp. Energy is generated by step ofone man being is too less but if number of steps increases
ultimately energy production also increases

2. Dance floors-
Europe is another one of the country which startedexperimenting use of piezoelectric crystal for energygeneration in DJ clubs. Floor is pressed by the dancer's feetand 0piezoelectric materials makes 0contact and generateelectricity. Generated electricity0 is nothing but 02- 20 watt.Itdepends 0on impact of the dancer's feet.

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