

ARDUINO POWER GENERATING USING HUMAN FOOT STEP

K.Raju¹, Bandari Theja² V.V.Ramana Rao³

^{1,2,3}Department of Electronics and Communication, St Martin's Engineering College, Hyderabad, Telangana, India-500100

Abstract:

The Footstep Power Generation, here we proposed a power generation technique through piezo sensors. This venture portrays the utilization of piezoelectric materials keeping in mind the end goal to collect vitality from individuals strolling vibration for producing and amassing the vitality. The essential working standard is based on piezo electric sensors. At the point when the ground surface is designed with piezo electric innovation, the electrical vitality created by the weight is caught by floor sensors and changed over to an electrical charge by piezo-electric transducer. These sensors are put such that it creates greatest yield voltage. This yield is given to our checking hardware which is microcontroller based circuit that enables the boost converter firing angel and charges a battery, and this power source has numerous applications. Our task to apply this type of power generation in highly populated area and gym.

Keywords: Arduino, Piezoelectric sensor, DC battery, GSM

I.INTRODUCTION

Day by day, the population of the country increased and therefore the requirement of the facility is additionally increased. At an equivalent time the wastage of energy also increased in some ways. So reforming this energy back to usable form is that the major solution [1]. As technology is developed and therefore the use of gadgets, electronic devices also increased. Power generation using conservative methods becoming deficient [2]. There is a necessity arises for a special power generation method. At an equivalent time the energy is wasted thanks to human locomotion and lots of ways [3].

II.PROPOSED SYSTEM

In the proposed system, the production of electric power from the foot step movement of the peoples and the pressure exerted during walking which is fritter away is the main theme of this project. The mechanical power transform into electric power because the pressure induced by the footstep and by using transducers and sensor is essentially called as "Foot step power generation system" [4].

The main aim is to beat the facility crisis throughout the planet. We can also know the battery stored voltage status and the solar panel output voltage by

sending a request message to the GSM modem. Then the microcontroller will send the reply to the user mobile with the battery voltage status and the solar panel output voltages.

III.BLOCK DIAGRAM

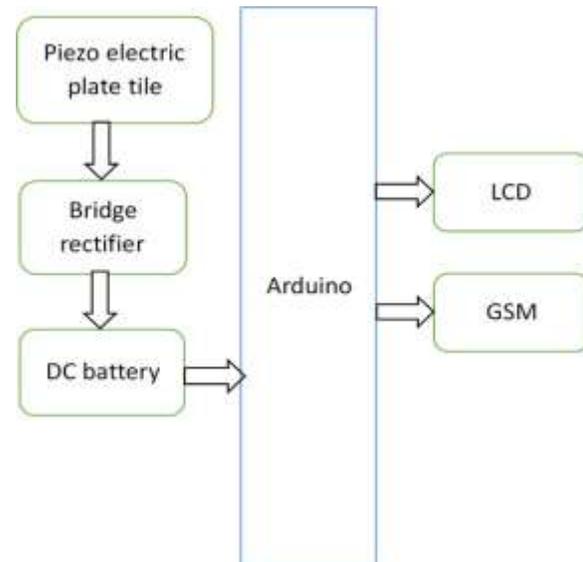


Fig III: Power Generation with human step using piezo electric sensor

A.Arduino Uno Board:

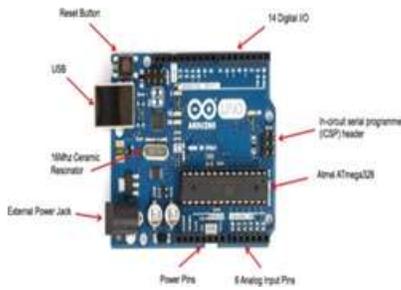


Fig A: Arduino Uno Board

Arduino is a popular programmable board accustomed creates projects. It consists of an easy hardware platform also as a free source code editor which features a “one click compiles or upload” feature [5]. Hence the designed in way that any user can use it without necessarily being an expert programmer. Arduino offers an open-source electronic prototyping platform that's easy to use and versatile for both the software and hardware [6].Arduino is in a position to sense the environment through receiving input from several sensors [7].

B. Piezo Electric Sensor:

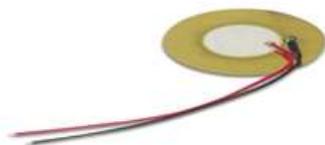


Fig B: Piezo electric sensor

A Piezoelectric / vibration sensor may be a device that uses the piezoelectricity to live pressure, acceleration, strain or force by converting them to an electrical charge [8].Based on piezoelectric technology various physical quantities are often measured the foremost common are pressure and acceleration [9]. For pressure sensors, a skinny membrane and a huge base is employed , ensuring that an applied pressure specifically loads the weather in one direction. For accelerometers, a seismic mass is attached to the crystal elements.

The main difference within the working rule between these two cases is that the way forces are applied to the sensing elements. during a pressure sensor a skinny membrane is employed to transfer the force to the weather , while in accelerometers the forces are

applied by an attached seismic mass [10]. Sensors often tend to be sensitive to quite one physical quantity. Pressure sensors show false signal once they are exposed to vibrations. Sophisticated pressure sensors therefore use acceleration compensation elements additionally to the pressure sensing elements. By carefully matching those elements, the acceleration signal (released from the compensation element) is subtracted from the combined signal of pressure and acceleration to derive truth pressure information.

Vibration sensors also can be wont to harvest otherwise wasted energy from mechanical vibrations. this is often accomplished by using piezoelectric materials to convert mechanical strain into usable electricity .

A piezoelectric transducer has very high DC output impedance and may be modeled as a proportional voltage source and filter network [11]. The voltage V at the source is directly proportional to the applied force, pressure, or strain. The output is then associated with this mechanical force as if it had skilled the equivalent circuit.

One disadvantage of piezoelectric sensors is that they can't be used for truly static measurements. A static force will end in a hard and fast amount of charges on the piezoelectric material. While working with conventional readout electronics, imperfect insulating materials, and reduction in internal sensor resistance will end in a continuing loss of electrons, and yield a decreasing signal. Elevated temperatures cause a further drop by internal resistance and sensitivity. the most effect on the piezoelectricity is that with increasing pressure loads and temperature, the sensitivity is reduced thanks to twin-formation.

C.DC Battery



Fig C: DC Battery

A battery may be a device which will store electricity. Some are rechargeable, and some are not. They store direct current (DC) electricity [12].

A battery really means two or more wet or dry cells connected serial for more voltage, or in parallel for more current, although people often call a cell A battery . AA, AAA, C, and D batteries all have 1.5 volts. The voltage of a cell depends on the chemicals used while the amount of power or current it can supply also depends on how large the cell is; a bigger cell of a given type can supply more amps, or for a extended time.

The chemical reactions that occur in a battery are exothermic reactions and, thus, produce heat. For example, if you allow your laptop on for an extended time, then touch the battery, it'll be warm or hot. However, the batteries utilized in laptops are called lithium-ion batteries and that they sometimes do have a fireplace hazard (A few years ago, dell laptops that that were powered by lithium batteries began to erupt , though this event was rare).

Batteries come in lots of different shapes and sizes and voltages. It is possible, but tough , to run wires to use an odd size battery for an odd purpose. Batteries are always more costly/expensive than mains electricity. But mains electricity isn't suitable for things that are mobile. Bicycles have tail-lights which will be operated by batteries, and sometimes by a touch generator powered by the wheels.

Hand and foot generators are often wont to replace batteries in various devices, but they will be tiresome. Wind-up generators are now available to power small clockwork radios, clockwork torches, etc.Since clockwork clocks have been around for hundreds of years, and batteries for two hundred, it is amazing that no-one thought of a clockwork torch until recently. Rechargeable batteries are recharged by reversing the reaction that happens within the battery. But a rechargeable battery can only be recharged a given amount of time (recharge life). Even iPods, with inbuilt batteries, can't be recharged forever.

Moreover, each time a battery is recharged, its ability to hold a charge is degraded a bit. Non-rechargeable batteries shouldn't be charged as various caustic and corrosive substances can leak, like potassium.

D. GSM Technology:

GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services [13].

GSM (Global System for Mobile communication) may be a digital mobile phone system that's widely utilized in Europe and other parts of the planet. GSM uses a variation of your time Division Multiple Access (TDMA) and is that the most generally used of the three digital wireless telephone technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends through a specific channel with two other streams of clients data, each in its own slot . It operates at either the 900 MHz or 1,800 MHz waveband . It supports voice calls and data transfer speeds of up to 9.6 kbit/s, along side the transmission of SMS (Short Message Service).

GSM Modem:

This GSM Modem can accept any GSM network operator SIM card and act a bit like a mobile with its own unique telephone number . Advantage of using this modem are going to be that you simply can use its RS232 port to speak and develop embedded applications. Applications like SMS Control, data transfer, remote and logging are often developed easily. The modem can either be connected to PC interface directly or to any microcontroller. It are often wont to send and receive SMS or make/receive voice calls.

It also can be utilized in GPRS mode to attach to internet and do many applications for data logging and control. In GPRS mode you'll also hook up with any remote FTP server and upload files for data logging. This GSM modem may be a highly flexible plug and play quad band GSM modem for direct and straightforward integration to RS232 applications. Supports features like Voice, SMS, Data/Fax, GPRS and integrated TCP/IP stack.



Fig D: GSM Module

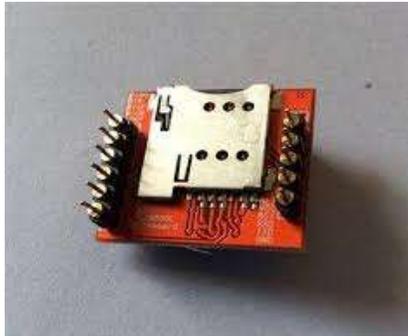


Fig D: SIM Connecting Point

E. LCD:

These components are “sophisticated” for being used in combination to microcontrollers, which means that they cannot be activated by standard IC circuits. They are used for writing different messages on a miniature PCB LCD [14].

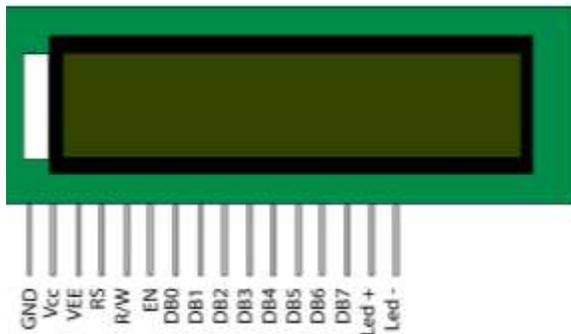


Fig E: LCD display

the component crossed here is low price and great flexibility most frequently used in all applications. It is based on the HD44780 microcontroller (*Hitachi*) and can display messages in two lines with 16 characters each. It displays all the 5x7 elements like alphabets, Greek letters, punctuation marks, mathematical symbols and much more. In addition, it

is possible to display symbols that user makes up on its own.

Automatic shifting character/message on display (shift left and right), appearance of the pointer, backlight etc. are done depending on commands.

IV. Advantages

1. Easy to install
2. Good sensitivity
3. It is wireles
4. wide bandwidth: audible – several MHz
5. Flexible
6. Devices can be monitored from anywhere in the world.
7. Power generation is simply walking on step
8. No need fuel input
9. It does not pollute the environment
10. Long life

Disadvantages

1. Possibility of failure due to sensors.
2. Care should be taken for batteries

Applications

1. Houses
2. Schools
3. Offices
4. Industries
5. Road side Footpath
6. Jogging tracks
7. Parks

V.RESULTS



Fig E: Arduino Power Generating Using Human Foot Step

“Power generation by foot step” is designed and developed successfully, for the presentation purpose a proto type module is constructed with lower ratings of devices, & results are found to be satisfactory and economical.

The Initiative of electric power generation without polluting the environment. The waste energy in form of human walking is utilized in this prototype. It is mainly useful at crowded places to install this system to produce electricity. This system is simpler and less noisy in operation and provide greater flexibility in working. This system plays an important role for producing electricity at places where there are no sources of electricity like village areas.

Working

Here we are going to generate voltage using footstep stress. The proposed system works as a basic medium to generate power using man force. it is very useful in public places like bus stands, theaters, railway stations, shopping malls, mostly crowdie areas etc. So, these applications are placed in public places where people walk and they have to travel on this prototype to get through the entrance or exist.

- Whenever force is applied in the form of mechanical energy ie stress on piezoelectric sensor, then the force is converted into electrical energy.
- Here, the output voltage is stored in the DC battery.
- The output voltage which is generated from the sensor is used to drive DC loads like any appliances
- The battery used here is a Lead Acid Battery.
- Here we use using Arduino and LCD display to display the amount of battery which is getting charged.
- LCD is interfaced with microcontroller. The 16 x 2 LCD is used to display the voltage generated by the piezo-electric tile.
- the battery stored voltage status and the solar panel output voltage can be seen in LCD by sending a request message to the GSM modem.
- Then the microcontroller will send the reply to the user mobile which is there in program with the battery voltage status and the solar panel output voltages.

VI. CONCLUSION & FUTURE SCOPE

This process provides electricity with the assistance of electronic components that produces application of energy using human footsteps. The ADC converter deployed in the circuit stores the charge for future constraints. So as to extend. The ability of the entire system if super capacitors and converter square measure employed in place of the conventional ones then a lot of charge will be hold on than the standard ones. The super capacitors store and discharge energy while not intense abundant renewable energy. Thus, the need of constant increase of power will be met by putting in these systems in heavily packed places.

In future aspects we can use this technique in the speed breakers at high ways where are rushes of the vehicles too much thus increases input torque and ultimate output of generator, If we are used this principle at very busy stairs palace then we produce efficient useful electrical for large purposes.

REFERENCES:

1. Chu, Steven, and Arun Majumdar. "Opportunities and challenges for a sustainable energy future." *nature* 488.7411 (2012): 294-303.
2. "Smartprivacy for the smart grid: embedding privacy into the design of electricity conservation." *Identity in the Information Society* 3.2 (2010): 275-294.
3. Willems, P. A., G. A. Cavagna, and N. C. Heglund. "External, internal and total work in human locomotion." *Journal of Experimental Biology* 198.2 (1995): 379-393.
4. Madhushree, M., Utkarsh Kumar Rawat, And K. Internal Guide. *Design And Fabrication Of Footstep Power Generation By Crankshaft Mechanism*. 2017.
5. Arduino, Store Arduino. "Arduino." Arduino LLC (2015).
6. Teikari, Petteri, et al. "An inexpensive Arduino-based LED stimulator system for vision research." *Journal of neuroscience methods* 211.2 (2012): 227-236.
7. Latha, N. Anju, B. Rama Murthy, and K. Bharat Kumar. "Distance sensing with ultrasonic sensor

- and Arduino." International Journal of Advance Research, Ideas and Innovations in Technology 2.5 (2016): 1-5.
8. Pisenti, Neal Carden. Isotope Shift Spectroscopy of Ultracold Strontium. Diss. University of Maryland, College Park, 2019.
 9. Rupitsch, Stefan Johann. "Measurement of Physical Quantities and Process Measurement Technology." Piezoelectric Sensors and Actuators. Springer, Berlin, Heidelberg, 2019. 407-509.
 10. Stewart, Robert E. "Integrated force balanced accelerometer." U.S. Patent No. 4,679,434. 14 Jul. 1987.
 11. "Impedance modeling and analysis for piezoelectric energy harvesting systems." IEEE/ASME Transactions on Mechatronics 17.6 (2011): 1145-1157.
 12. Chen, Haisheng, et al. "Progress in electrical energy storage system: A critical review." Progress in natural science 19.3 (2009): 291-312.
 13. Peersman, Cvetkovic, et al. "The global system for mobile communications short message service." IEEE Personal Communications 7.3 (2000): 15-23.
 14. Hymavathi, P., and C. Amala. "An Energy Awareness In Smart City Lessons Learned."