

# “Samarthyam”-Advance Footstep Power Generation

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**Abstract:** -- ‘Samarthyam’- The buzz for power. The man has needed and used energy at an increasing rate for his sustenance and wellbeing ever since he came on the earth a few million years ago. Due to this a lot of energy resources have been exhausted and wasted. Proposal for the utilization of waste energy of foot power with human locomotion is very much relevant and important for highly populated countries like India and China where the roads, railway stations, bus stands, temples, etc. are all overcrowded and millions of people move around the clock. The project advanced footstep power generator system is used to generate power from human footsteps. The system allows for a platform for placing footsteps. It uses Piezo sensors to generate the power. The Footstep Power Generation System is eco-friendly, it reduces waste of energy, it is of less maintenance cost, it is of ultralow noise and wide dynamic and temperature range. This project is used for street lighting, mobile charging. It can be used in power failure situations. The application areas of this project involve public areas like temples, streets, metros, railway stations. This entire system will be integrated with software for displaying the amount of power generation with the help of IOT technology.

**Index Terms:** Power, locomotion, Piezosensor, Spring module..

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## I. INTRODUCTION

Energy is one of the most important issues around the world. Especially in Bangladesh energy crisis is a big problem. Renewable energy sources can be a great media to solve this energy crisis problem in Bangladesh. As we know natural resources will finish one day. That’s why researchers are trying to introduce substitute energy sources from nature. That must be green and not harmful for the environment. Energy harvesting is defined as capturing minute amounts of energy from one or more of the surrounding energy sources. Human beings have already started to use energy harvesting technology in the form of windmill, geothermal and solar energy. The energy came from natural sources, termed as renewable energy. Renewable energy harvesting plants generate kW or MW level power; it is called macro energy harvesting technology. Moreover, micro energy also can produce from those natural sources that are called micro energy harvesting. Micro energy harvesting technology is based on mechanical vibration, mechanical stress and strain, thermal energy from furnace, heaters and friction sources, sun light or room light, human body, chemical or biological sources, which can generate mW or  $\mu$ W level power. Micro power supply needs is increasing greatly with time as our technology is moving to the micro and nano fabrication levels. Our discussion on this is based on generating micro

energy from vibration and pressure using piezoelectric material.

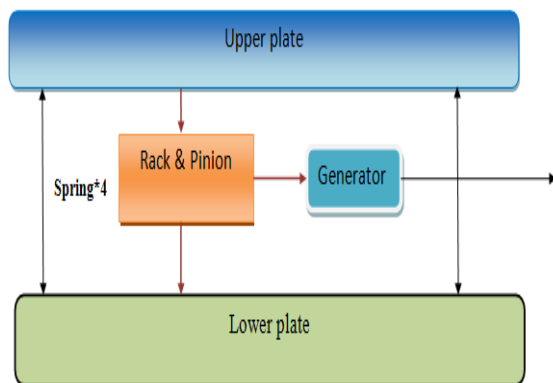
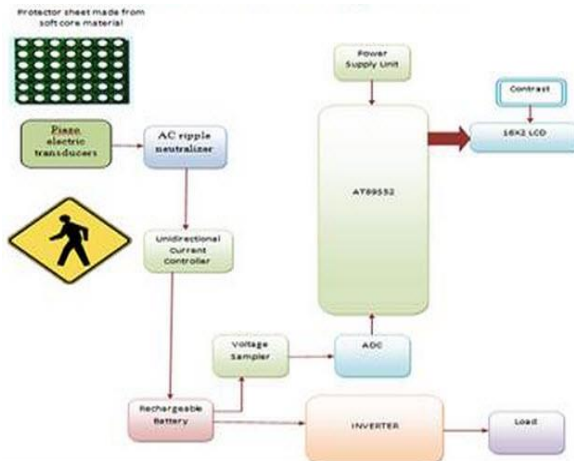
## II. DESCRIPTION

In this proposed system, use of embedded technology makes this system efficient and reliable. Micro controller (AT89S52) allows dynamic and faster control. Liquid crystal display (LCD) makes the system user-friendly. AT89S52 micro controller is the heart of the circuit as it controls all the functions. In this project the conversion of the force energy in to electrical energy. The control mechanism carries the A.C ripples neutralizer, unidirectional current controller and 12V, 1.3Amp lead acid dc rechargeable battery and an inverter is used to drive AC/DC loads. The battery is connected to the inverter. This inverter is used to convert the 12 Volt D.C to the 230 Volt A.C. This 230 Volt A.C voltage is used to activate the loads. We are using conventional battery charging unit also for giving supply to the circuitry. Here we are using 16X2 LCD to display the voltage values of the rechargeable battery using AT89S52. This project uses regulated 5V, 500mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac out put of secondary of 230/12V step down transformer.

### Block Diagram

The main blocks of the footstep power generation system involves the following

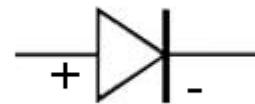
- AT89S52 Microcontroller
- Piezoelectric Sensor
- AC Ripple Neutralizer
- Unidirectional Current Controller
- Voltage Sampler
- 16X2 LCD
- Lead Acid Battery
- ADC



### III. EXPLANATION OF BLOCK

**AC Ripple Neutralizer:** Capacitive filter is used in this project. It removes the ripples from the output of rectifier and smoothens the D.C. Output received from this filter is constant until the mains voltage and load is maintained constant. However, if either of the two is varied, D.C. voltage received at this point changes. Therefore a regulator is applied at the output stage. **Piezoelectric 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. **Step-Down Transformer:** Step down transformers are designed to reduce electrical voltage. Their primary voltage is greater than their secondary voltage. This kind of transformer "steps down" the voltage applied to it. For instance, a step down transformer is needed to use a 110v product in a country with a 220v supply. Step down transformers convert electrical voltage from one level or phase configuration usually down to a lower level. They can include features for electrical isolation, power distribution, and control and instrumentation applications. Step down transformers typically rely on the principle of magnetic induction between coils to convert voltage and/or current levels. **Diodes:** Diodes allow electricity to flow in only one direction. The arrow of the circuit symbol shows the direction in which the current can flow. Diodes are the electrical version of a valve and early diodes were actually called valves.



A diode is a device which only allows current to flow through it in one direction. In this direction, the diode is said to be 'forward-biased' and the only effect on the signal is that there will be a voltage loss of around 0.7V. In the opposite direction, the diode is said to be 'reverse-biased' and no current will flow through it.

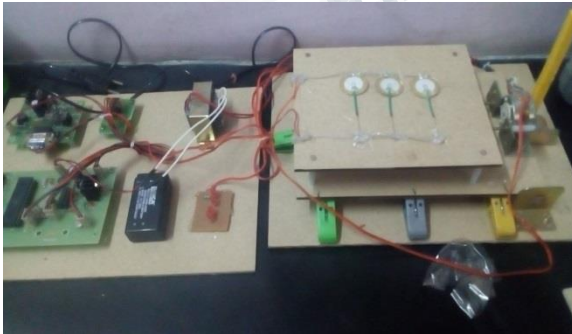
**Microcontroller:** The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of

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RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes.



Working The source of pressure can be either from the weight of the moving vehicles or from the weight of the people walking over it. There is a simple DC gate motor which is used as generator. The DC generator is coupled with the suspension plates. The piezoelectric material converts the pressure applied to it into electrical energy. The output of the piezoelectric material is not a steady one. So a bridge circuit is used to convert this variable voltage into a linear one. Two possible connections were tested - parallel and series connections. Again an AC ripple filter is used to filter out any further fluctuations in the output. The output dc voltage is then stored in rechargeable battery. The voltage produced across the tile can be seen in a LCD, website and in IOT app.



**Applications**

- This power source has many applications as in home application, street lighting.
- As energy source in remote locations.
- Charging electronic gadgets.
- Self-generating, so no need of external source.
- This power can used in emergency power failure situations.

**Advantages**

- Power generation is simply to walk on step.

- No need of fuel input.
- This is nonconventional system.
- No moving parts – long service life.
- Compact highly sensitive.

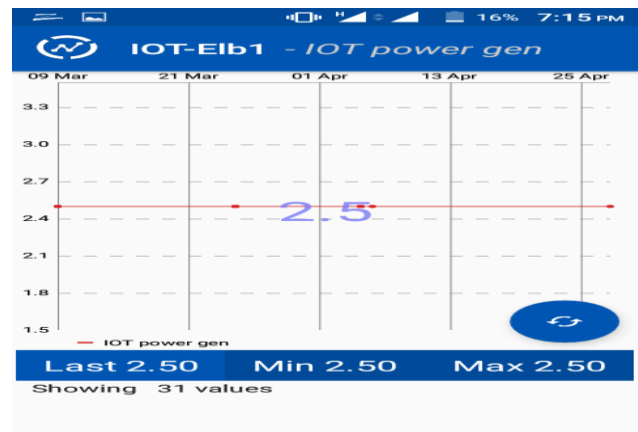
**Disadvantages**

- Only applicable for the particular place.
- Initial cost of this arrangement is high.
- Care should be taken for batteries in case of website and app failure.

**IV. RESULTS AND DISCUSSION**



Sl no	Weight in Kg	Voltage in Volts	Current in micro amps	Power in mW
1	50	4.6	47	0.2162
2	55	6	233	1.398
3	60	9.3	277	2.5761
4	65	9.5	304	2.888



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**V. 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 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.

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