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Footstep Power Generation Using Piezoelectric Transducer

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Abstract: ***In the modern world, power is becoming more and more crucial for all tasks. Even with our existing array of renewable and nonrenewable power sources, we are still unable to meet our needs for electricity. The population of humans is one of these assets. For this project, jogging or walking is how we produce energy. Calorie burning occurs when you go up and down stairs. People can generate power with their weight when they walk on steps or platforms. The energy produced will be kept in a battery for subsequent use around the house. This technique can be applied in sites with a high pedestrian traffic volume, such as movie theaters, colleges, schools, and temples. Applying pressure causes the control mechanism's piezoelectric sensors to produce electrical energy. The energy produced by walking on the floor is pollution- and noise-free. You may use this technology's energy to charge other electrical devices, such as laptops and mobile phones.***

I. INTRODUCTION

In today's industrialized world, road infrastructure may be one of the main concerns. According to recent studies, changes in the route (such as road construction or unexpected obstructions) and excessive or inappropriate speed are the main causes of five fatal or severe accidents. Accident reduction and mitigation are important concerns for traffic authorities, the auto industry, and transportation research groups. Adopting modern driver aid systems, which are auditory, haptic, or visual signals supplied by the vehicle to notify the driver of the possibility of a collision, is one crucial course of action.

While some business cars now have access to these technologies, trends in the future indicate that safety can be enhanced by automated driving controls and a growing array of sensors on both the vehicle and the road infrastructure. Two notable examples of driver assistance systems are the controller, which can maintain a gradual user-specified speed, and its development, the accommodative controller (ACC), which gives CC the ability to keep a safe distance from the preceding vehicle. The inability of those systems to distinguish between straight and curved portions of the road—where a speed reduction is necessary to prevent accidents—is one of their drawbacks. These days, non-conventional energy systems are vital to our country. Anything that transforms one type of energy into another might be considered a transducer. One type of transducer is made of piezoelectric material. This material is squeezed, or force or pressure is applied to it, converting it into an electric voltage that depends on the force or pressure used. This type of material is also referred to as a piezoelectric sensor. Voltage measuring devices, which are used to measure stresses or pressures, may readily measure the electric voltage produced by a piezoelectric transducer. It is impossible to quantify a physical quantity like mechanical stress or force directly. Piezoelectric transducers can therefore be employed. From the beginning of humankind's existence, energy has been more and more necessary for survival and well-being.

II. PROPOSED SYSTEM

The piezoelectric material in the suggested system transforms applied pressure into electrical energy. The weight of the people walking over it or the weight of the driving cars may be the cause of pressure. The piezoelectric material's output is not constant. Therefore, to change this variable voltage into a linear one, a bridge circuit is utilized. Any other variations in the output are removed using an AC ripple filter. After that, a rechargeable battery is used to store the output DC voltage. A combination of a few piezo films was studied since the power output from a single piezo film was incredibly low. Parallel and series connections were the two potential connections that were examined. The voltage output from the parallel connection did not significantly increase. Additional piezo-film increases voltage output when connected in series, but not in a linear fashion. Figure 1 displays the proposed system's block diagram.

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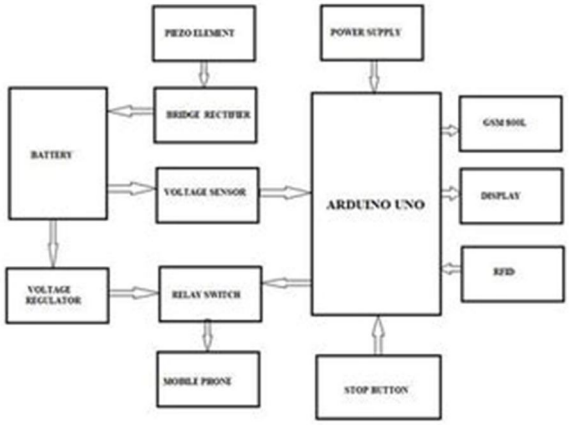


Figure 1 block diagram

III. METHODOLOGY

A rectifier is used to transform the fluctuating DC voltage produced by the strained piezoelectric sensor into pure DC voltage. To stop current from flowing backward to sensors, a unidirectional current controller is used to store pure DC voltage in batteries. The DC-DC boost converter, which is coupled to an inverter, steps up the voltage to enhance it. When a load is connected to the inverter, the direct current (DC) output is changed or converted to an alternate current (AC). The gate pulse is applied by the Driver circuit to activate the MOSFET. The PIC regulates voltage and provides a digital signal to an LCD display that is linked to it in order to show the output voltage.

IV. WORKING

When the pressure is applied on the sensors, the sensors will convert mechanical energy into electrical energy. This electrical energy will be stored in the 12V rechargeable battery connected.

TOOLS USED:
Piezoelectric sensors
Aurdino Uno
Voltage booster
Lcd
Battery

V. FUTURE SCOPE

1) *Flooring tiles:* The flooring tiles are made up of rubber which can absorb the vibration and under these the piezoelectric materials are placed so as when the movement is felt by the material they can generate the electricity. When these kind of tiles are installed in locations where large crowd movements are expected such as in railway Station ,bus stations, airports, malls, footpaths Etc,



fig 1: Lighting Floor

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2) *To Power Street Lights:* The present invention relates generally to methods of electrical power generation and more particularly is a method and device to generate electricity by using traffic on existing roadways to drive an electrical generator. The idea of constructing the special types of roads which generate the electricity is a unique application in power harvesting methodology. This system works by embedding tiny piezoelectric crystals into the road. Specially designed road for power harvesting when automobiles or vehicles drive over through this road then the piezoelectric crystals sense the force and pressure which generates a small electrical charge. Though small charge is generated by single car but 1 Km stretch of such road could generate around 400kw-enough to run eightsmall cars. Such experimenting have already started in Israel.

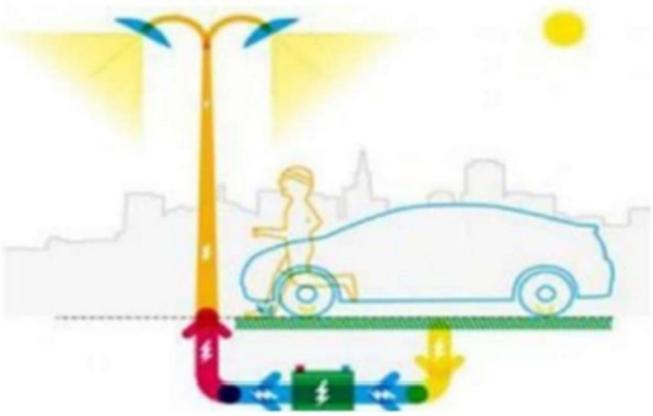
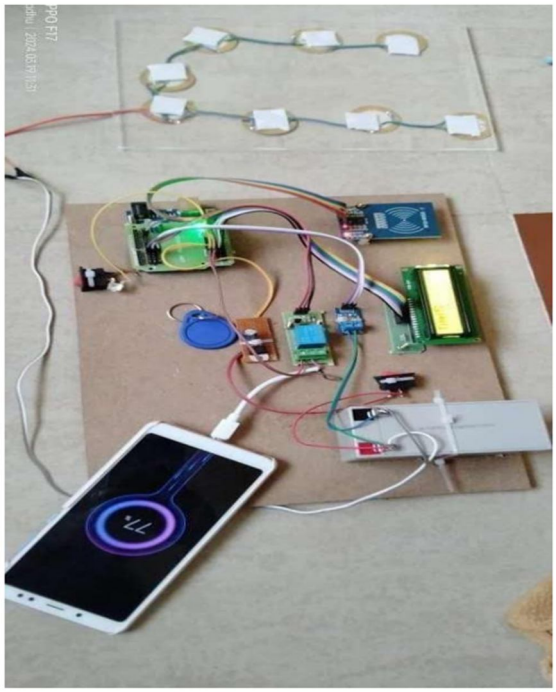


fig 2: Power Street Lights

VI. CONCLUSION

In conclusion, the proposed mobile device charging system utilizing piezoelectric energy harvesting and RFID authentication offers a sustainable, efficient, and innovative solution to address the challenges of energy consumption, accessibility, and security in charging infrastructure. By leveraging renewable energy sources and advanced authentication mechanisms, the system provides several advantages and applications across diverse environments.

VII. RESULT

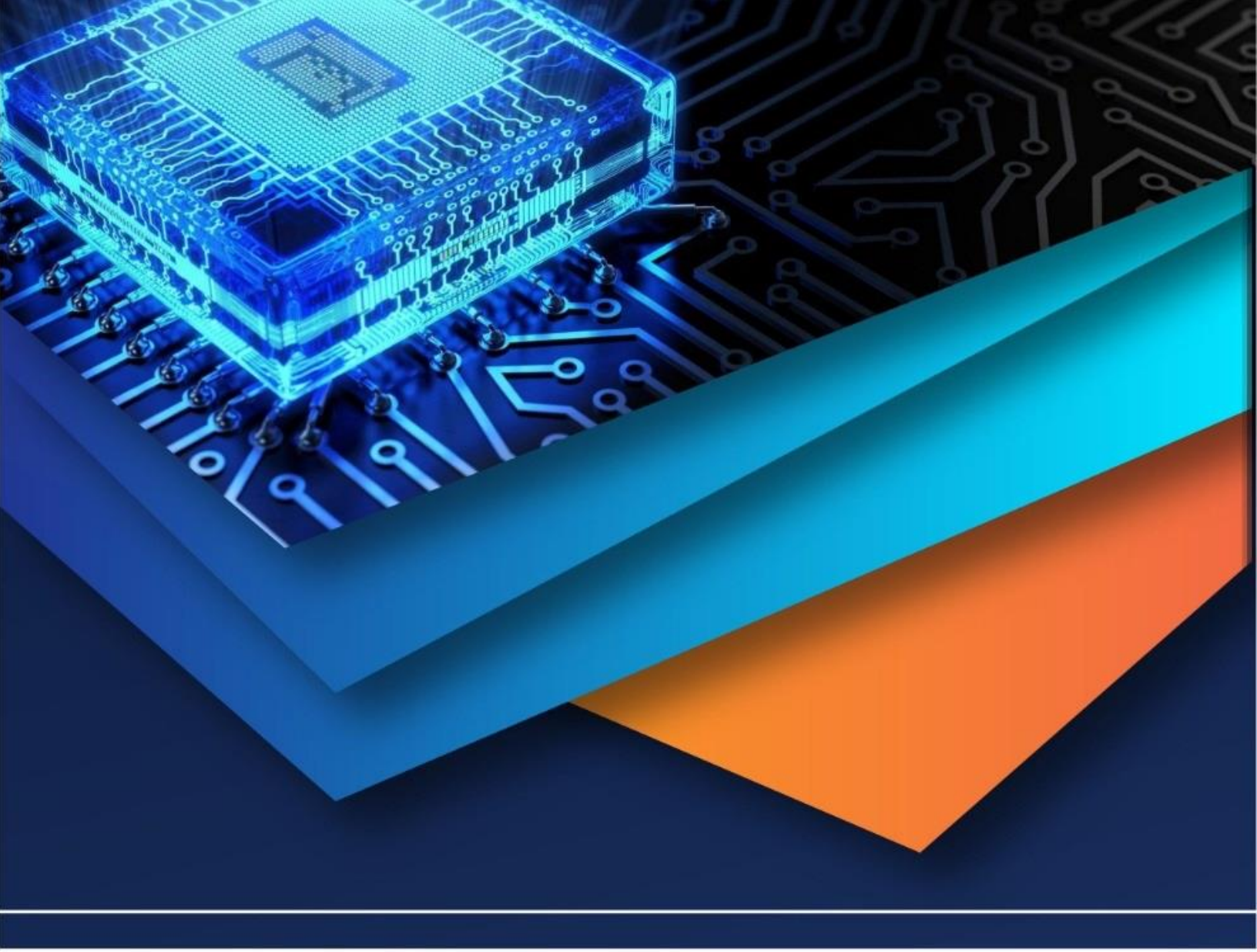


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