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Automatic Street Light Using IR Sensor

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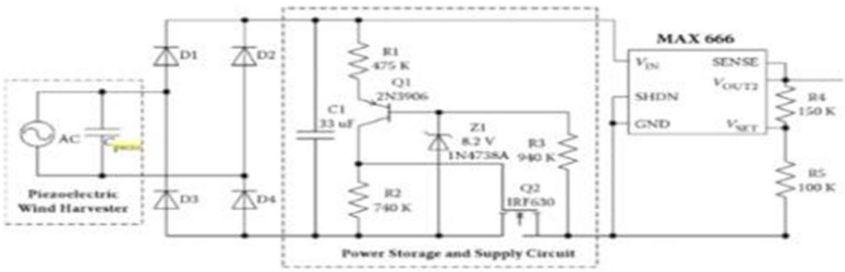
Abstract: *The natural resources used for powering purposes are limited resources and getting diminished day by day as the demand for it is rising. In developing countries, Amount of generated electrical energy is unable to keep up with the demand, and also there is scarcity of raw materials for producing the energy. In countries like India, 1/5th of energy consumption is through street lighting. The conventional street lights are still designed according to old standards of reliability. Because of this, large amount of energy is wasted and it puts a lot of stress on the natural resources used for generating electricity. Alternative sources are now explored to prepare for the future dearth of traditional energy sources. The Smart street light provides a solution for energy saving which is achieved by sensing an approaching vehicle using the IR sensors and then switching ON a block of street lights ahead of the vehicle. A well designed energy efficient street light system should permit traffic and pedestrian to travel at night with great visibility in safety and comfort while reducing energy consumption and cost. The main aim of our project is to make use of the energy generated as the result of movement of vehicles on road to control the street lighting and thereby increasing their efficiency and also automating their process.*

Keywords: Piezoelectricity, Energy harvesting and storage, Automation, Innovative energy source.

I. INTRODUCTION

The vehicles moving on the road tends to vibration of the piezoelectric material placed below the road due to deformation, caused by the pressure of vehicle passing. Piezoelectricity is an electric charge that accumulates in certain solid materials (such as crystals, certain ceramics) in response to applied mechanical stress. The electricity generated from one piezo is quite small and not useful for practically, thus we have an array of piezoelectric transducers. Considering the large number of piezo arrays and huge pressure applied by heavy vehicles, the electricity generated increases. The electricity generated from these transducers is further rectified and regulated using, energy harvesting circuit. Now this instantaneous energy is not used directly but the electricity generated throughout the day is stored in batteries. Hence, the cumulative amount of electricity stored in the battery is high enough for powering of street lights. There is also an automation circuit which controls the street lights, according to, whether it is day or night, and also changes the intensity of street lights on the basis of density of vehicles, at any given time. Street lights will be off in the day and will turn on automatically at night. At night street lights will glow with high density if there is a fair amount of traffic, else street lights will glow at low intensity, further saving the energy.

II. SCHEMATIC DIAGRAM



Circuit Diagram of Phase 1 of our proposed system

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III. ALGORITHM

1. Vehicle passing on road.
2. It pass through IR sensor
3. Sensor séance the motion
4. Arduino turns light on with delay of 5 sec.
5. And light glows.

IV. WORKING

When the vehicle moves over the road, there is deformation of the road due to the pressure applied by the moving vehicle. In our project, we propose to place the arrays of piezoelectric materials placed below the surface of road.

Hence, due to deformation of road, these piezoelectric materials vibrate up to some extent, thereby generating electricity because of the principle of piezoelectricity. The electricity generated from one piezo set is in very low, but the overall energy from arrays of piezo is considerable.

Light dependent resistor is the resistor whose resistance decreases with increasing light and provides high resistance when it is dark. The relay and LDR circuit is so designed such that, in the daytime, energy from battery is not used byarduino or other peripherals and hence energy is stored in the battery without getting discharged. In the night time arduino will be powered by the battery. The working of the relay circuit is based on the principle of comparator. LDR and resistors are arranged in form of voltage divider. One pair serves as the input for the inverting input while other for non-inverting input. The resistance of LDR changes according to the light intensity. Accordingly, At day time, output of comparator is low and transistor is not on. Relay isolates arduino from battery. In night time, comparator gives high output turning transistor on, and relay connects battery to the arduino.

Arduino acts as the controlling system for the street lights (power LEDs). Arduino is interfaced with power LEDs and ultrasonic sensors. So the power LEDs will be on only during night time. Further if ultrasonic sensor detects the passerby or vehicle, the corresponding street light glows at the high intensity. As soon as, the vehicle pass away LED will switch to low intensity. This will further save energy and will be particularly of great importance after midnight time, when traffic is not too heavy.

In practical implementation of this project the values of voltage and current is much higher a1nd also components used will be of much greater load, for example, piezo discs are replaced by PZT materials. But the principle of operation remains same

V. RESULT

The results of various experiments we conducted are listed down in the table below. For demo purposes, these values of voltages and currents were recorded. However, for actual implementation of this project, the values of electrical voltage and current generated will be much higher because of tremendous pressure applied by the vehicles and also, for the practical purposes, the piezo disc will be replaced by PZT sheets, which have much stronger piezoelectric effect.

VI. CONCLUSION

LEDs are going to be vital lighting option in near future due to its peculiar low power consumption and cost effective nature. Our prototype will help in eliminating the current sodium vapour street lamps with better LED comprised lamps operated smartly using LDR, and piezoelectric material thereby increasing energy efficiency and reducing electricity costs. Harvesting energy from the environment is being considered as a viable option to replace the current power supplies for energy constrained embedded systems. The desire to use self-powered devices drives to achieve enormous growth in the field of energy harvesting. With the few limitations such as low amount of power generated using the power harvesters, the researchers are working towards generating new methods. These methods would help in placing the energy harvesters as one of the best sources to power portable devices in the field of wireless technology

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