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The Breakthrough in the Field of Power Generation-Speed Breaker

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Abstract: ***This project presents a new approach in the field of power generation. Already we have many conventional methods for the power generation but those techniques create enormous amount of pollution to the environment. Here in this project we have shown how we can use a simple speed breaker unit for the power generation using rack and pinion mechanism. On the daily basis, huge amount of kinetic energy is being wasted on roads. We can store that energy in the batteries and later use that energy for various applications.***
Keywords*: Rack and pinion, Speed breaker, power generation, DC generator, battery*

I. INTRODUCTION

In recent years, the energy crisis problem is at its peak because of increased dependency on non renewable resources of energy for the power generation. We have to solve this problem as soon as possible or else there is a threat of exhaustion of these resources in the future. In few decades, there is a tremendous increase in the population and this leads to the increased use of vehicles. The kinetic energy of these vehicles is wasted in a large amount when it crosses the speed breaker.

Some of the different methods of speed breaker by which we can generate the electricity are rack and pinion , roller and crankshaft mechanism. In these, we have chosen rack and pinion arrangement. As and when the vehicle goes across the speed breaker hump , the rack and pinion which is under the speed breaker moves in downwards direction. The kinetic energy then changes into mechanical and then finally into electrical energy using a dynamo.

II. METHODOLOGY

A. Block Diagram

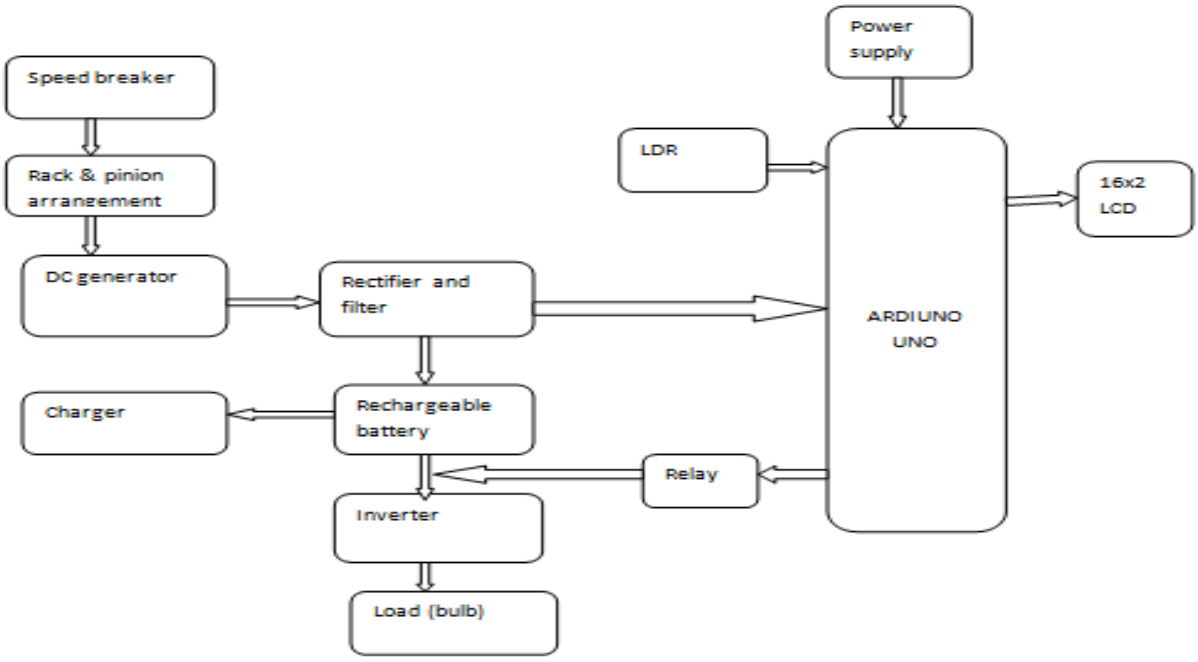


Fig. 1 Block diagram

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B. Construction Details

The main components and their functions which are used in the project are listed as follows:

1) *Rack and Pinion* : Rack and pinion is a type of linear actuator which is used to convert between rotary and linear motion. The flat toothed part is the rack, while the pinion is the gear.
2) *Springs* : Spring is an elastic body that will be distorted when it is being compressed and recover its shape when it is not.
3) *Spur Gears* : Spur gear is a cylinder with the teeth aligned parallel to the axis of rotation.
4) *Flywheel* : Flywheel is a heavy wheel located on the shaft to smooth out delivery of power from a motor to a machine. It reduces the fluctuation in the speed.
5) *Shaft :* A shaft is a rotating element that transmits rotary motion to the other element.
6) *DC Generator* : It converts the mechanical energy into electrical energy. The mechanism follows the rule of dynamically induced emf.
7) *Rectifier & Filter Circuit*: Usually rectifier is used for conversion of dc into one way dc voltage. The capacitive filter is used to converts the pulsating dc into pure dc.
8) *Battery* : It is a device which stores energy generated from the generator. The energy is stored in the form of chemical energy in the battery .This energy can be used as and when it is required. For this project we have used lead acid battery.
9) *Inverter*: Inverter is used to convert the dc into ac supply. Normally the inverter comprises of step up transformer.
10) *Relay:* Relay acts as switch. For our project we used SPDT relay which is used for on and off purpose.
11) *ARDUINO UNO*: This microcontroller used for this project is *ARDUINO UNO* whose main job is monitoring. It is also used for interfacing purpose
12) *LCD*: The alphanumeric LCD is used here for displaying how much voltage generated throughout the project.
13) *LDR sensor*: The LDR sensor module is used over here so that whenever day light is low street lights can be turned on and when day light is sufficient street lights are off.

C. Working

A rack and pinion unit is build under the speed breaker. As and when the vehicles goes over this speed breaker the rack and pinion also goes down. The springs are compressed and this makes the shaft to rotate on its own axis. The shaft is again connected to the dc generator which is also known as dynamo. The dc generator converts the mechanical energy into electrical energy. With the help of rectifier and filter the pulsating dc is converted into pure dc. This electrical energy stored in a rechargeable battery for further use. We have used an inverter in our project which will convert the dc into ac since some application needs ac power. LDR is being used in this project which when dark turns n the street lights and when enough light is presents turns off the street lights.

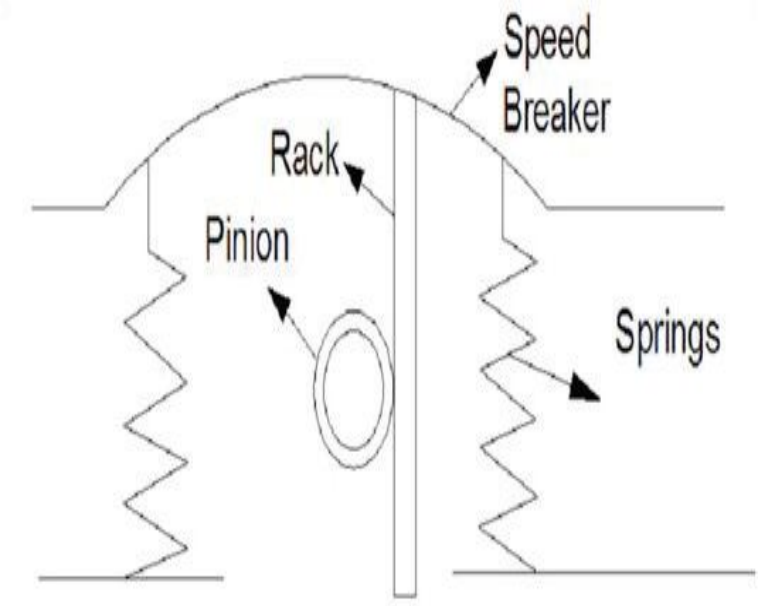


Fig. 2 rack and pinion

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D. Schematic Diagram

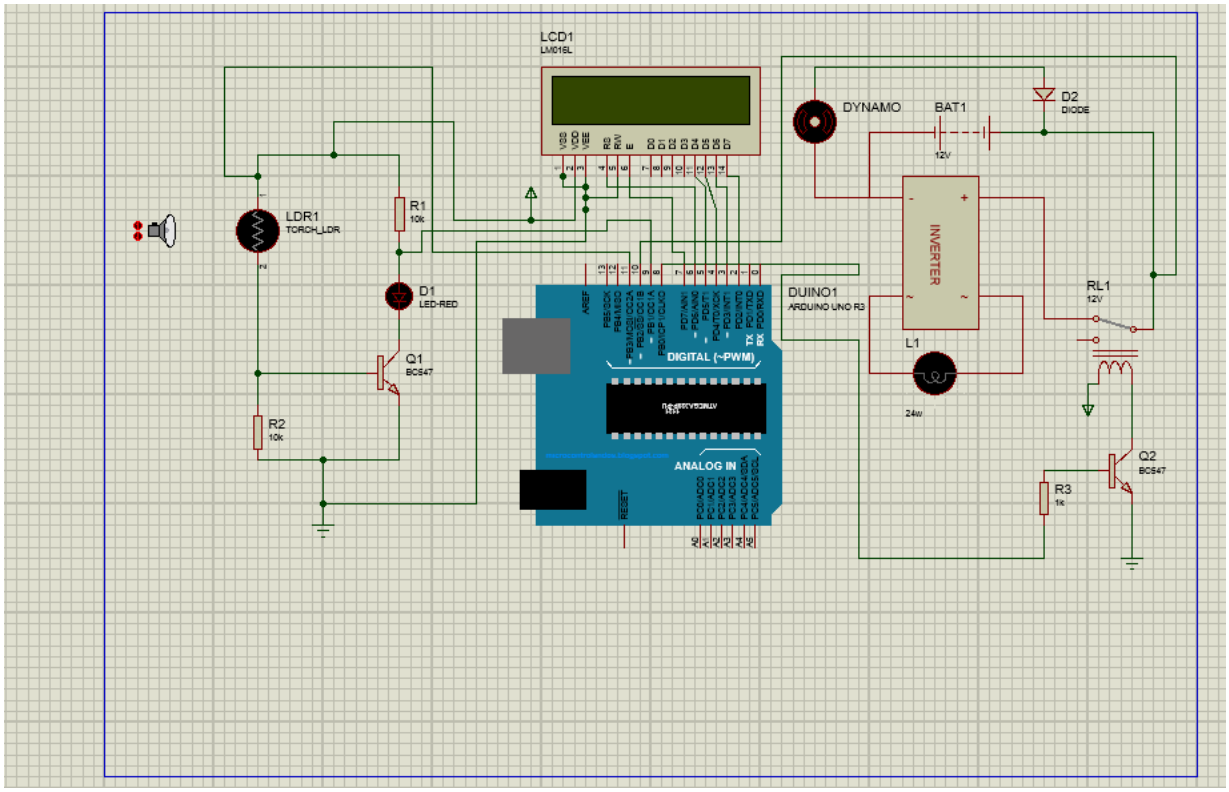


Fig. 3 Schematic diagram

III.RESULTS

A. Experimental Setup

All the component are connected to the microcontroller through the corresponding pins. DC generator's main job is to convert the mechanical into electrical energy. LDR sensor is utilized over here which when detects darkness, the microcontroller makes the street lights on using relay and when light is sensed it makes the light off. This saves a lot of power wastage as the turning on and off is automatic. All the connections are shown in below figure.

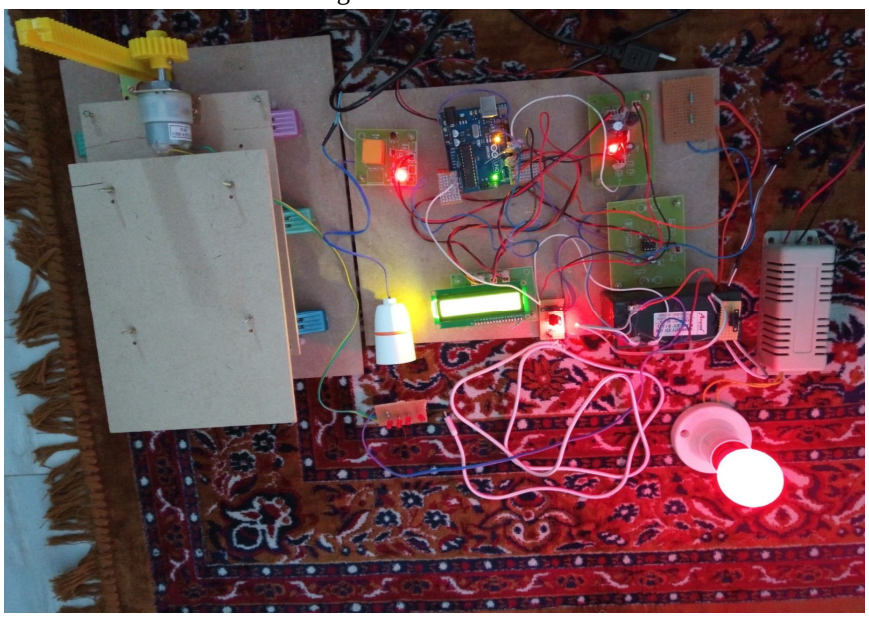


Fig. 4 Entire rack and pinion unit along with other components

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B. Output



Fig. 5 Generated output when light is detected



Fig. 6 Generated output when darkness is detected

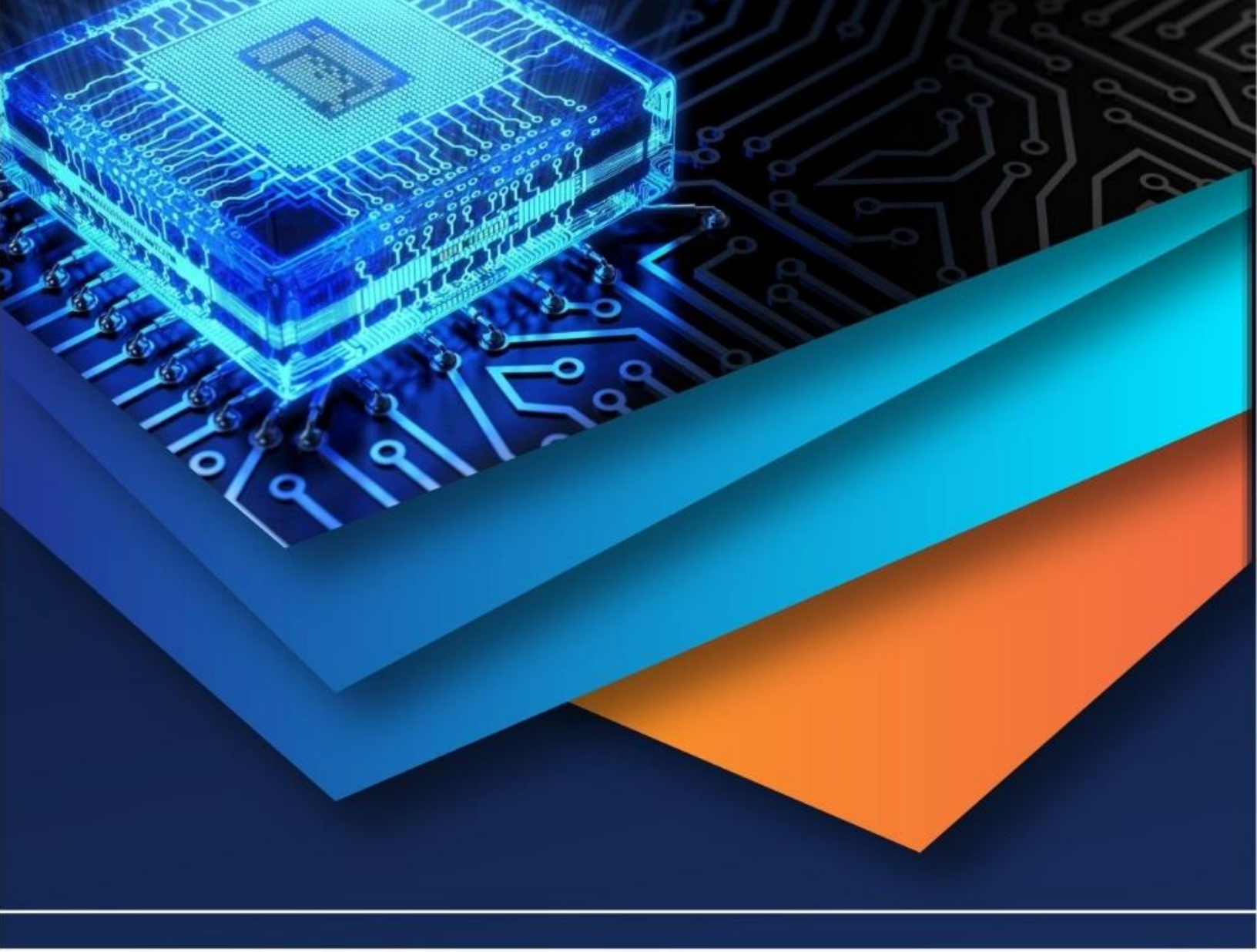
IV. CONCLUSIONS

This paper presents a noble approach for power generation. We have seen that due to tremendous increase in population, the present power generation techniques are insufficient to meet the requirements. In the future, it's going to a great help to the country & to the world as well, since it will save a huge amount of electricity that's being wasted in illuminating street lights. We should come up with an alternative that not only solves this increased demand of power but should aids to the country's economy also. This project is one of those techniques which can be utilized in place of earlier conventional method. This project also helps in pollution reduction because this doesn't require any fuel which causes pollution to the environment.

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