Smart Street Lighting System

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ABSTRACT

The concept of our project is to create Smart Street Lightening System used to turn ON and OFF the supply automatically without any manual help. It works on the process of movement in environment. i.e., vehicle passing through the speed breaker or sensing the intensity of sunlight. In this project the system is to develop a street light energy saving control system to reduce energy if no vehicles pass through certain roads. The proposed system saves a large amount of the electrical power. In addition, it may increase the lifetime of the lamps. Operation of this system is to maintain the intensity of street lighting to 40% of the maximum intensity if no vehicles passing through the road. When the IR sensor detects movement of the vehicle, the street lights will be switched to 100% intensity. LDR is used in the system to detect day/night. Once day is detected all the street lights will be in the OFF state. Arduino microcontroller is used to control the system. IR sensor functions as a vehicle detector will be send a signal to the Arduino will be control the intensity of the LED while the current sensor is used as the current detector LED lamp. The prototype for the street lighting energy saving control system is also has safety usage that is the light will not turn OFF completely but only dimming and the user can easily see from far away and the light will full turn ON if it detecting movement. As it is observed that, if any of the street light has been damaged then unless it is been complained manually it will never come to operation state. So, to detect the proper operation of the street light an LDR sensor is placed below the street light once its night and as all the lights should glow at 40% of maximum intensity if the value of LDR is not changing then it implies that the street light is not working properly. The system has shown a great energy savings and if the system can be upgrade with many functions and user friendly the system can be commercialized and the cost for retrofitting the street lighting energy saving control system can be lowered.

KEYWORDS - *Street light, Smart control, LDR, speed breaker, light Intensity, power generation.*

I.   INTRODUCTION

In present scenario, continuously electricity supply to the consumers is not possible because of production of electricity is less than the utility of electric energy. The solution can be saving the electrical energy rather than production of the energy. Saving the energy is more economical than the produce the electrical energy. Street light monitoring is the perfect solution for saving energy, the aim of street light monitoring system using wireless sensor network is to control use of electricity via remote ON/OFF/DIM of lights which can save energy costs and maintenance costs and increases the life of lamp. We all know that; street lighting is one of the important parts of a city's infrastructure where the main function is to lightning the streets of area if cities during the night. The demand of electricity increases day by day. So, energy saving plays a vital role in present scenario. As energy is generated at huge amount, the energy consumed also is at the same rate. And the electrical energy is generated mostly due to non-conventional energy which is depleting day by day. On the national highway there are approximately 500 street lights and each street light consume approx. During night the street light continuously glows till day or sometimes even day time. So, when 500 street lights are considered the energy consumption will increase up to75000W. This power consumption is huge, this can be minimized by the following methodologies illustrated below. First technique is by using the IR Sensors, the street light glows Thus, the power consumption reduces considerably up to30%.and the second technique is by using LDR'S this detects the light and the light doesn't glow during the day time. This reduces power consumption by 20%. Thus, by these techniques 50% of power consumption is reduced.

II.   PROBLEM STATEMENT

It is very common to see the street light alight all night, which is a great waste of energy. The power consumption is relatively high day by day. Some streets are not fully occupied like the main city streets; sometimes they are empty for a certain period time. Based on the problem, the observation of street lighting was done to improve the street lighting control system to make sure the street light can operate properly. By applying this system, it can

reduce energy consumption and also can reduce electricity wastage. Therefore, it is important to know the ways how to minimize the power consumption of the street light.

III.   OBJECTIVE

• To develop a system that controls the streetlights by automatically switching them when there are people or vehicles around the post when it is dark.

• To overcomes the disadvantages of the conventional Street Lighting System and saves electricity.

• To Control and monitor streetlights from remote place.

• The generation of electricity using speed breaker is one of the easiest ways as now-a -days everyone is having vehicle.

• Energy Required for Street Light during night time would be generated by speed breakers during day time.

IV.   LITERATURE SURVEY

Literature review is an assignment of previous task done by some authors and collection of information or data from research papers published in journals to progress our task. It is a way through which we can find new ideas, concept. There are lot of literatures published before on the same task. Some papers are taken into consideration from which idea of the project is taken.

[1] Murat Kuzlu; Manisa Pipattanasomporn; Saifur Rahman, -This paper attempts to show how energy can be tapped and used at a commonly used system Assessment of Communication Technologies Supporting Smart Street Lighting Applications. By using this system energy consumption is also reduced because now-a-days the manually operated street lights are not switched off properly even the sunlight comes and also not switched on earlier before sunset.

[2] A. Padam Rao -This paper attempts to show how energy can be tapped and used at a commonly used system- the road speed breakers. The number of vehicles passing over the speed breaker in roads is increasing day by day. A large amount of energy is wasted at the speed breakers through the dissipation of heat and also through friction, every time a vehicle passes over it. There is great possibility of tapping this energy and generating power by making the speed-breaker as a power generation unit.

[3] Y. M. Yusoff, R. Rosli, M. U. Karnaluddin and M. Samad- Paper helped us in learning how to program to control the light intensity of the LEDs and about the sensor usage and connection to the board.

[4] R. Müllner, A. Riener - Learning of the paper involves wide-ranging accessibility to the emerging technology like light emitting diodes and their eco-friendly nature to the environment and long-lasting ability motivates the user to believe that power conserving street lighting systems are a reality and can be implemented in the country.

[5] M. Castro, A. J. Jara and A. F. G. Skarmeta - In this paper authors described the need of smart lighting system. They have described that the sustainable development of cities affects the overall electricity use of lighting and the curiosity in offering greater control of its use. They have proposed the solution for lightning system through Machine-to-Machine protocols.

V.   PROPOSED SYSTEM

A. Working of Smart Street Lightning System

Generally, street light controlling system is a Simple concept which uses a transistor to turn ON in the night time and turn OFF during the day time. The entire process can be done by a using a sensor namely LDR (light dependent resistor). Nowadays conserving the energy is an essential part and day by day energy resources are getting decreased. So, our next generations may face a lot of problems due to this lack of resources. This system doesn't need a manual operation to turn ON/OFF the streetlights. The street light system detects whether there is need of light or not.
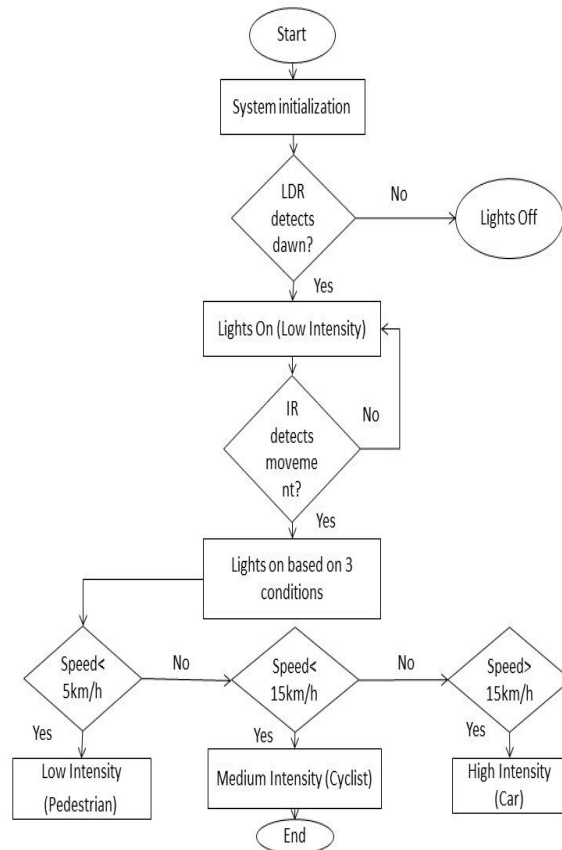
Figure 1: Block Diagram of Smart Street Lightning System

Following are the main steps of our proposed algorithm:
- When the sun is about to set till sun is about to rise, our purposed system will glow lights at default intensity, that is 40%.
- During the day time, the street lights will be switched off.
- If there is motion on the road near the street light, as detected by IR sensor, our purposed system will check time interval and glow the light according to the interval set intensity.
- The next 3 lights will glow from the light where motion is detected.
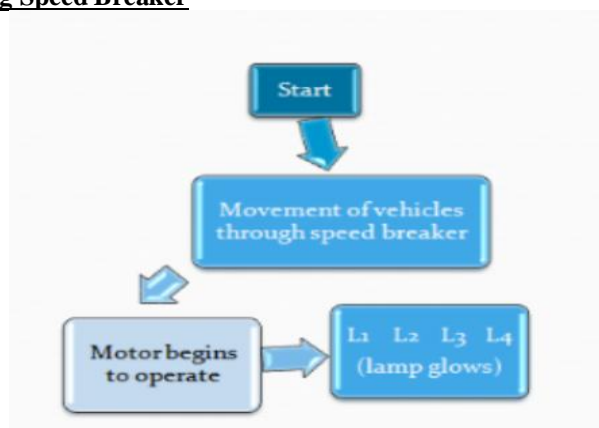
B. Power Generation using Speed Breaker

Figure 2: Flowchart of Power Generation using Speed Breaker

Electricity is generated by replacing the traditional speed breakers with some simple mechanism. As vehicles pass over the speed breakers, they spin the rollers which are connected to a generator which in turn generate electricity.A large amount of energy is wasted by the vehicles on the speed breakers through friction, every time it passes over it. Energy can be produced by using the vehicle weight and speed.So here we propose

a smart speed breaker that generates power. The reciprocating motion of the speed breaker is converted into rotary motion.We design a smart speed breaker that can pass vehicles coming from both sides and yet generate energy from it.The system makes use of mechanical assembly with metal sheets with link ages that press down with spring arrangement.

VI. METHODOLOGY
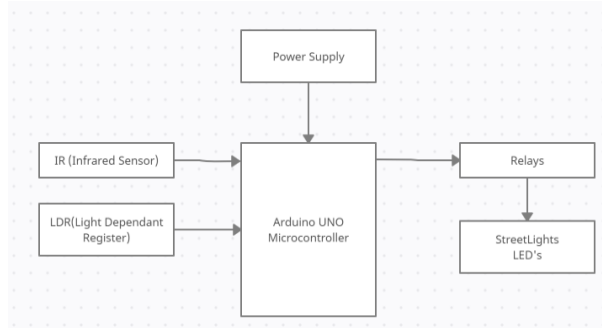
The above fig.3 represents block diagram of the project carried out. The main aim is to reduce the power consumption by the street lights, the present situation is like the street lights on the national highway will be switched ON in the evening and OFF in the morning. But the actual timing of these street lights to be switched ON is when there is absolute darkness. With this the power will be wasted to some extent. This project gives the best possible solutions for the power wastage. In our project we are using LDR, whose resistance varies according to the amount of light falling on its surface, this gives the indication whether it is day/night time. The IR sensors have been placed on both the sides of the road which are monitored by microcontroller. The IR'S will be activated only during the night times. If any obstacle that is vehicle or a person crosses IR automatically the light gets brighter till the obstacle crosses to certain distance and then the street light gets dimmer. So as mentioned 50% of the power consumption is reduced. In this project we use microcontroller (ATMELGA328P) and a regulated voltage supply of 5V to the Arduino.

VII. RESULT

The following tabulated data represents results of activation of street lights.

Table 1 Result of implemented system

SI. No	LDR1	LDR2	Street Light State
1	Low Light	Low Light	ON
2	Low Light	Dense Light	OFF
3	High Light	Low Light	OFF
4	High Light	High Light	OFF

The following tabulated data represents results of results of activation of lights because availability of vehicle.

Table 2 Result of activation of light because of availability of vehicle

SI.NO	LDR 1	LDR 2	IR Sensor 1	Street Lights 100% ON	Street Lights 75% ON
1	Low Light	Low Light	ON	Street Light 2	Street light 1,3,4,5,6

Table 3 Result of activation of light because of availability of vehicle

SI.NO	LDR 1	LDR 2	IR Sensor 1	Street Lights 100% ON	Street Lights 75% ON
1	Low	Low Light	ON	Street Light	Street

	Light			5	light 1,2,3,4,6

VIII. ANALYSIS

The present street light system is a timer-based system in which there is a fixed time for it to be ON and OFF which gets ON at the same time irrespective of the weather. But our proposed system works on the detection of light intensity. In winter season darkness appears early than that in summer season or in cloudy weather or dim daylight our street light will glow even in the day time. It is more convenient for the public and it saves wastage of energy. This system consists of a roller mechanism instead of a rack pinion system which makes our system simpler and easy to implement. In this, we have avoided complexity and made this a robust system. It is also a cost-effective system, easy to implement, and long-lasting. No fuel transportation required. No consumption of any fuel which is a non-renewable source of energy.

IX.CONCLUSION

This paper discusses the technical aspect of smart street light system and the possible energy saved by implementing this proposed system. The current problem with the conventional system is the long hour operational time which cause a lot of electricity cost. This is a huge waste if it is not taken seriously. Thus, this project proposed the solution to save the energy consumption of street light. Two sensors were used in this proposed smart street light system which is IR Sensor and LDR sensor. By using IR sensor to detect speed, it can control the light intensity level which lead to saving energy. Besides, LED bulb used in this paper is also able to control the power consumption use by street light and saves the energy up to 40% to 45% per month. Other than that, All these were achieved in this paper.

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