

Energy Conservation By Street Light Control

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Abstract - In day-to-day life, electricity use has been an area of concern worldwide. Most of the power stations are based on the fuels that are conventional with not having many non-renewable sources available. Solar and wind are the new and renewable power sources that we should proceed on to. As we should not run into the power shortage of electricity, effective use of the available conventional and non-renewable sources should be done. The essential part of day-to-day life is Street lights that consume large amounts of electricity. The large amount of power consumption takes place by the manual operated street lighting system as they work on the given condition of from evening to early morning and heavy installation cost play the role of great disadvantage as we are in one of the developing countries. By using on/off mechanism and targeted dimming we can reduce the power consumption by 35%. The overall consumption of the energy can be reduced by 42% by doing the proper maintenance of the system. The proposed approach is the utilization of energy in an effective way that controls the automatically operating street lights when there are vehicles on the road at the evening and night time. This system is flexible and consists of different types of sensors and a controller which makes it the intelligent street lighting system and thus overcomes disadvantage^[1]

Key Words: Energy Conservation, Street Lighting System, ON/OFF Mechanism, Sensors and a Controller Light Dependent Resistor (LDR), Infrared Sensor (IR).

1. INTRODUCTION

Energy efficiency is the key factor while designing the street lighting system. To utilize the limited power resources efficiently, an energy efficient light system is needed which can manage the usage of energy efficiently. The old lighting standards and inefficient devices the traditional lighting system is not much more reliable as it results in energy losses, automation and fault problems.

In the traditional street lighting system, all the street lights are switched on at the exact time in the evening and switched off early in the morning manually which is causing Human errors and excessive energy consumption. Introduction of

Automation in the street lighting system can reduce energy consumption and eliminate human errors to a great extent.

To overcome these challenges, the energy consumption efficiently is done by introducing a type of automation in this system. Type of sensors such as Light Dependent Resistor (LDR), Infrared sensors (IR), Relays, Arduino uno r3, LEDs are used in this Street lighting system.

2. CONCEPT OF STREET LIGHT AUTOMATION

This automation system is very easy to implement in practical day to day life by using the key components such as IR sensor, LDR, Arduino board and LEDs. The brain of this system is an Arduino board which will help to control this system. The eye of this system which will detect the moment of humans or vehicles on the road is the IR sensor, LEDs representing the street lights in the system.

The absence or presence of the sunlight will be detected by the LDR. During the daytime, the system will be able to detect the sunlight with the help of LDR, and due to this the street lights will be turned OFF. However, during the evening time the system will detect the absence of light then the turning ON of the street light will take place.

If the system is not detecting any vehicles or human movement on the road by the IR sensor after the turning ON of the system, the street light will glow at very low intensity. The glowing of the street light takes place when the IR sensor will detect any vehicle or human movements on the road.

Relay used in this system will be operating by the signals given by the Arduino. When LDR detects the absence of light and the movement takes place the IR sensor gets operated and the output is given to the Arduino. This signal helps in switching ON of the street light (LEDs) and in the morning when the presence of light is detected by LDR and the signal is given to the Arduino. This signal helps in switching OFF the street light in the morning. This way of using the automation will result in reducing the energy consumption of the street lights.

3. CONTROLLER AND SENSORS

Arduino is an easy-to-use hardware and software. Arduino is able to read the inputs given to the board from a number of other components such as sensors, buttons etc. or by software commands and is able to turn the given inputs in the output form by LEDs, running the motors or software commands to a particular server.

Software used to program the Arduino board is Arduino IDE Software. The type of sensors used in this system is LDR and IR where LDR is Light Dependent Resistor which is an analog sensor which will change its resistance value according to the light intensity falling on the sensors. The sensitivity of the sensor depends on the intensity of light. The connection of the LDR is given to the A0 Pin of the Arduino board and analog Read() function is used to read the light intensity.

The analog pin of Arduino is where the LDR is connected in the circuit. The controlling of LEDs is done by this sensor by detecting the presence or absence of the sunlight. The LDR acts as an insulator by offering high resistance when there is sufficient sunlight during the day time. High analog value reading given by the LDR to the Arduino will result in automatically turning off all the street lights (LEDs). Where there is absence of sunlight during the evening and night time, LDR will detect the dark surrounding and will offer low resistance to the Arduino and will act like a conductor which will result in automatically turning ON of the street lights (LEDs).

During this process, the IR sensor will start its operation by detecting vehicles or any human movements on the road. As the operation of the IR sensor starts, by default the output of the sensor remains 0 when there are no vehicles or human movements on the road. But in the other case when there are vehicles or any human movement the IR sensor will detect and the output will change to 1.

4. PROPOSED STREET LIGHT SYSTEM

Following is the block diagram of the proposed system:

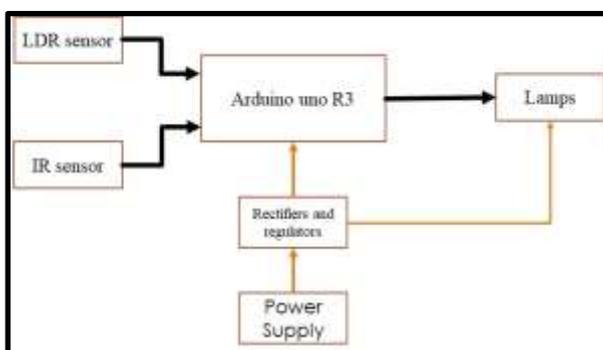


Fig -1: Overall Block Diagram

The proposed system of the street light shows that the heart of the system Arduino gets its supply from the power supply of 5v DC supply whereas the power supply given to the LEDs is 230v ac. The sensors used will work as a feedback element. The LDR sensor will work on the intensity of light and will give appropriate signal to the Arduino whereas the IR sensor

will detect the motion of vehicles or humans and will give the signal to the Arduino.

As per the signals received from the LDR and IR sensors Arduino will provide the input signal to the relay. As a result the relay working as an operating switch will operate according to the given signal from the Arduino. For the programming of the Arduino the flow chart given below should be used. So by using this system, the ON/OFF mechanism is used efficiently and the excessive use of energy is avoided and this helps in conservation of utilization of electricity.

The circuit diagram for the proposed system is shown below:

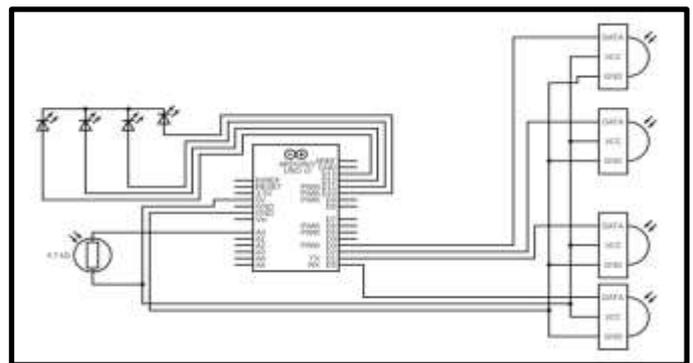


Fig -2: Overall Circuit Diagram

For the working of the Arduino, it requires programming which is done with the help of Arduino IDE software. The basic flowchart for the programming of the Arduino for expected working of the proposed system is given below.

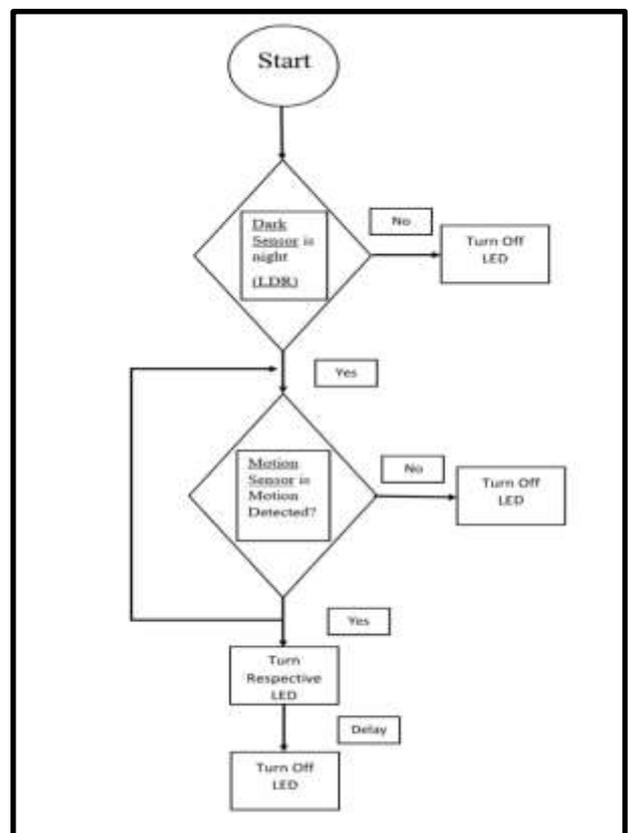


Fig -3: Flow Chart

5. ADVANTAGES OF PROPOSED SYSTEM

- The proposed automation in the street light system eliminates the human errors which leads us to proper usage of energy.
- This system will efficiently manage electricity which will lead us to greater savings.
- This system will help us in reducing the light pollution and will create an eco-friendly environment.
- This system will help us in improving the safety of the people.
- It will help to increase the lifetime of the devices used for the street lightings.

6. CONCLUSION

In the existing street light system, because of manual operation, there is a problem of unnecessary power consumption in the absence of traffic and humans and human errors which reduces the efficiency of the overall system. However, by introducing automation in this system with the help of Arduino and all the other sensors, both of the problems are eliminated which leads us to overall improvement of the efficiency of the system.

The overall cost of the proposed system may be more than the current street lighting system but in the long term it will save much more power than the current system. So after the completion of the payback period of the system, it will become more economical.

7. REFERENCES

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