

Smart Street Light

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Abstract

The Smart street light system controls the automatic ON and OFF street lamps according to the atmospheric situation. This street lamps automatically detects any movement in their surroundings. The PIR senses any movement of the objects in the street. The LDR sensor is used to sense the brightness that makes the street lamp to turn on and off depending on the environmental brightness. This system is used to reduce the power consumption for the government. Thus, implementation of smart street lights is used to reduces the power wastage and consumes power efficiently. The transistor used in this project turns off and turns on lamps at day and night time respectively with the output from the LDR sensor by sensing the environmental brightness. The backup for the LDR sensor uses the RTC (Real Time Clock) to activate street lamps based on time. If the street lamps gets damaged, it automatically sends an alert message to the electricity board using GSM module. When the interrupt occurs in the electricity board, the power consumption automatically switch-over to the solar energy from battery charged by solar panels. The light varies depends on the humidity of the atmosphere. The humidity level of the environment is sensed by humidity sensor. These all process are controlled by Arduino.

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1. Introduction

Nowadays, street lighting systems in industry or in cities square measure increasing chop-chop. The necessary concerns within the area of various technologies like electrical and physics square measure price valuable, automation and power utilization. There square measure completely diverse street lighting systems square measure urbanized to take care of and management the lighting systems. These lighting systems square measure accustomed management and reduce energy consumption. Street light-weight dominant is one in all the foremost developing system in Bharat to protect the energy.

A major portion of the national electricity production goes to street lighting. The present street lighting resolution models in several elements of the globe don't seem to be terribly economical and optimized. Because of a similar reason, we frequently realize street lights ON throughout the day time and OFF throughout the night.

Visualize thousands of street lights overwhelming thousands of watts, wasting valuable electricity. It conjointly reduces the utilizable lifetime of the lamps.

This offers United States an considerable range for improvement within the method street lighting systems work these days. The recommended method to transferable regarding better operational potency focus on 2 aspects – substitution accessible lamps with diode (LED) lamps and creating the road lights 'smarter'.

The aim of machine-controlled street lamp executive system victimization IOT is that the management of energy by falling electricity wastage similarly on cut back the hands. Within the manual street lamp system light-weights it's dynamic from sunset to sunrise with most power even once there's ample light accessible. This energy depletion are often avoided by change off lights mechanically.

2. Project Description

The Light dependent electrical device (LDR) and object sensing element that square measure used as a neighborhood of the sensible street light-weight structure to acknowledge daytime and lightweight and differentiate the movement of walker and motor vehicle one by one. The LDR identifies the surrounding area of daylight and

naturally shut down the road lights within the day time and switch it on while not daylight that reduce the problem of manual change of street lights. The item sensors identifies the progress of any object and provide order the micro-controller to glow the road lights with 100 percent strength and with none movement within the street offer order the micro-controller to glow with four-hundredth of its most strength. Now I actually have used Associate in Nursing Arduino Uno to regulate all the order from LDR and Object sensing element and implement them licitly. Essentially it acts because the mind of the complete structure. Streetlights square measure the fundamental a part of any town since it facilitate higher nighttime visions, safe roads, and coverage to public areas however it consume a quite massive amount of electricity this text illustrates the road light-weight that glows on police work motor vehicle movement once sunset and sends alert message to Electricity Board (EB) once the sunshine gets broken. This work is enforced employing a planned Arduino board for providing the desired strength of sunshine at numerous times. The planned work has achieved a much better performance compared to the prevailing system.

3. Block Diagram

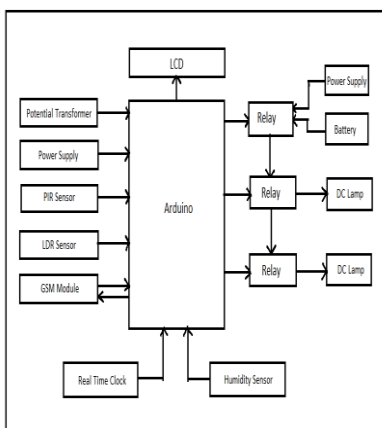


Figure 1: Block diagram of entire project

4. Hardware components

Arduino

The Arduino Uno is a programmable board that contains special re-programmable flash memory ATmega328 controller with build in on-chip oscillator. The programs are written and dumped into the Arduino controller using the "Arduino IDE". The board consists of 14 input and output digital pins numbered from 0 to 13 out of which 6 Pulse Width Modulation pins represented with tilt (~) symbol. The PWM pins are used to regulate voltages for the sensors used in the project. The board provides 6 analog input pins numbered from A0 to A5 to read the sensor values. The power supply to the board are

provided through USB of 5V or through the adapter voltage ranges between 7V and 20V.

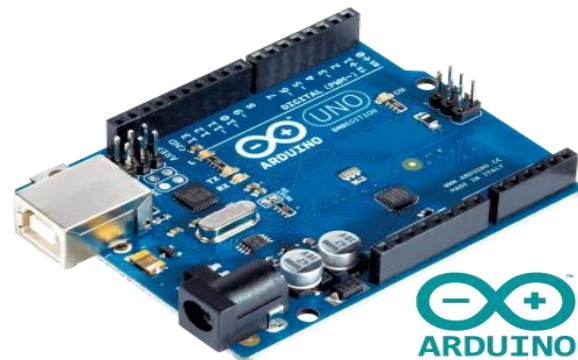


Figure 2: Arduino Uno Board

Light Dependent Resistor (LDR)

The resistance of the LDR (Light Dependent Resistor) is depends on the light intensity impinging on it. The resistance provided by the sensor varies with light intensity. Thus, the resistance decreases and increases with increase in light strength and decrease in light strength respectively. This shows that the resistance is inverse of the light intensity. The day and night prediction are possible using this type of sensor by facing this sensor to sunlight. The light intensity from the sun is used to calculate the day and night estimation. The use of this LDR sensor in the project is reliable and cost efficient. As being a passive sensor, no power supply is required thus also saving power thereby helps in automatic switching ON /OFF the street lights.



Figure 3: LDR Sensor

Passive Infrared (PIR)

The infrared fluctuations from a warm object are sensed by PIR to detect motion. It is a passive device and made up of crystalline material which generates surface electrical phenomenon when exposing to heat in the form of infrared. PIR sensor senses the motion of object entering or leaving the surrounding under a range. Changes in their temperature due to incident infrared radiation are converted into electric signals using electric sensing unit. Due to this it generates electric charges when infrared light strikes a crystal.

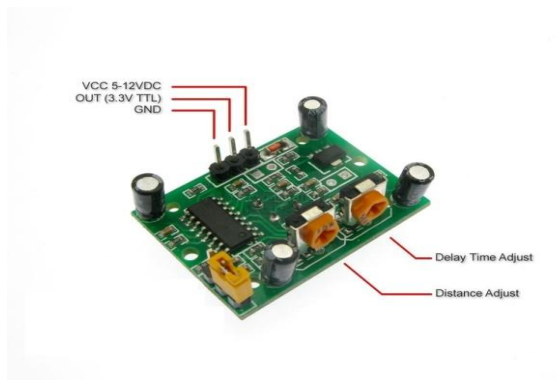


Figure 4: Passive Infrared Sensor

Humidity Sensor

Humidity Sensor is used to measure the humidity values. Humidity values are by quantities such as temperature, pressure, mass, resistivity to calculate humidity. DHT11 capacitive humidity sensor is used here to measure humidity where operating voltage (3.5V – 5.5V) and operating current is 0.3mA. Based on values of the humidity level, light will perform accordingly.

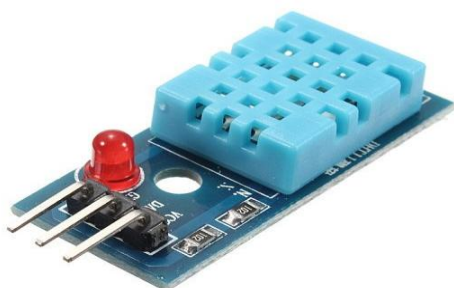


Figure 5: Humidity Sensor

Real Time Clock

A real-time clock (RTC) keeps track of the current time to turn off and on the street lamp at day and night. RTC had an inbuilt 3V lithium cell thereby gives the accurate time even at power cut. This acts as a backup feature for the automatic street lamp.



Figure 6: Real Time Clock Sensor

GSM Module

GSM (Global System for Mobile Communication) module is used for mobile communication through network. SIM900 module is used here to alert the Electric Board (EB) regarding lamp damage. Any network SIM card can be used in a GSM modem to communicate. The commands that interacts with GSM and Arduino Uno is AT commands. The operating voltage of the module is 12V. For serial communication the RX and TX of the Arduino are used with the TX and RX of the GSM module.



Figure 7: GSM Module

Solar Power

The solar cells are made based on the principle of photo-voltaic effect. The solar cells are used to convert sunlight into electricity and eco-friendly. The solar energy produced is a Direct Current source. The solar panels are used to charge the battery at the daytime necessary for the circuits and street lamps to turn on.



Figure 8: The solar energy

5. Working

Table 1 Light intensity changes with time duration

S.No	Test Case	Working Description
1.	Peak Hours (6.00 P.M to 10.00 P.M)	White lamp will glow with 100% efficiency(Fig.9)
2.	After Peak Hours (10.00 P.M to 6.00 A.M) (If there are no objects in motion)	White lamp will glow with 40% efficiency(Fig.10)
3.	In Misty Situation (10.00 P.M to 6.00 A.M)	Yellow lamp will glow with 100% efficiency(Fig.11)
4.	IN Misty Situation (10.00 P.M to 6.00 A.M) (If there are no objects in motion)	Yellow lamp will glow with 40% efficiency(Fig.12)
5.	If light gets damaged (At any time)	Alert message will send to the Electric board through GSM(Fig.13)

Case 1

White lamp will glow with 100% efficiency, when the time is peak hours (6.00 P.M to 10.00 P.M). (Fig.9)



Figure 9: White High Intensity Lamp

Case 2

White lamp will glow with 40% efficiency, when the time after peak hours (10.00 P.M to 6.00 A.M) and also there are no objects in motion detected. (Fig.10)



Figure 10: White Low Intensity Lamp

Case 3

Yellow lamp will glow with 100% efficiency, when the environment is in misty situation (10.00 P.M to 6.00 A.M) (Fig.11)



Figure 11: Yellow High Intensity Lamp

Case 4

Yellow lamp will glow with 40% efficiency, when the time after peak hours (10.00 P.M to 6.00 A.M) and also there are no objects in motion detected. (Fig.12)



Figure 12: Yellow Low Intensity Lamp

Case 5

If the light gets damaged in any period of time, an alert message will send to the electricity board through the GSM module. (Fig.13)



Figure 13: GSM & Arduino UNO Connectivity

6. Conclusion

This paper expounds the design and improvement of good Street lighting management structure circuit. Circuit meets potential suitably to show road light-weight ON/OFF. Within the waken of coming up with the circuit that control the sunshine of the road while portrayed within the past segments. LDR detector and therefore the object sensors square measure an 2 basic living up with condition till expectations to the circuit. On the off probability that 2 situation are consummated the circuit can do the wished work as indicated by the actual system. Each detector controls the killing ON or the lighting phase. The Arduino UNO are used for the effective use for street light. The controller sends an order to the lights is ON within the spots of the actions. Further the drawback of the road light-weight framework utilizing timer controlled has been succeeded, wherever the structure depends on upon physical phenomenon detector. At lengthly last this feedback circuit is used as a district of a protracted route connecting the urban areas furthermore because the rural areas. The scheme points were to reduce the reactions of the current street lighting structure and find out a solution for energy loss. During this scheme, the primary factor to try and to line up the inputs any fields of the framework to manage the lights of the road. The model acts not astonishingly and can end up to be exceptionally costly and can convince all the current boundaries if actualized on a massive level.

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