Intelligent street light for smart city

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Abstract:

   This project acts as an important role to provide an efficient and energy saving Automatic lighting system by evaluating the outside lighting condition and then adjusting the lights accordingly and which is its main aim."Intelligent Street Light For Smart City" is a environment-based project developed platform. Different kind of light sources, some are natural ones while others are man-made light sources. The man-made light sources have only two modes of operation that is switched on and switch off there is no intermediate level that can be set according to the surrounding lighting condition and at the end everything needs to be controlled manually. These lead to wastage of electricity and at the same time a manual control is not effective in the modern era.We propose an advanced light control system which is capable of replacing the old generation light control system.

The system is implemented by embedded platform and is equipped with a photo sensitive detector (LDR) which gives the required input for operation.The working of our light control system is based on the amount of luminous energy in the environment at that moment of time. Depending upon the light intensity at that instant the lighting of the lighting system is adjusted. If the cloudy climate appears the lights will automatically switched ON.Otherwise the lights will be switched OFF. And when the person or any object is in movement at night time it 'will sense based upon the distance and the street light turns on. Under the light control mode, the LED street lamp is turned off in daytime and at night automatically ON..The embedded main board, including the Arduino,LDR,IR sensor are used as a processing module for the input that we get from peripheral devices (LDR).Application of such a system can be implemented on workstations, park lights, street lighting system, head lights of automobiles and much more.

Keywords: *Arduino UNO, LDR, IR sensor, Lighting Units Arduino Programming, Automatic Control, Energy Efficient.*

I. INTRODUCTION

 We are living in the world where everything goes to be automatic from your washing machine to your ceiling fan. The world revolves around the word automation and the ones that are automated are said to be of next generation because they limit the involvement of humans. They are self-sufficient to operate on their own and thereby, saving time and cost by being more efficient than the manual ones. But lighting systems have yet to make its move in these automated crusade. We have just started the crusade in our attempt here.The main objective of this project is to implement an auto-intensity control of LED-based on LDR which is interfaced to an Arduino board. As the surrounding light decreases slowly from evening to night, the light intensity gradually increases and then gets gradually decreased from night to early dawn hence saves energy . If the cloudy climate appears the lights will automatically switched ON. And when the person or any object is in movement at night time it 'will sense based upon the distance and the street light turns on. Under the light control mode, the LED street lamp is turned off in daytime and at night automatically ON.The process repeats every day. As stated earlier,

   Application includes: park lights, street lights, head light in automobile and many unexplored options.

   The goal is to reduce the amount of energy consumed and thereby reducing the cost incurred due to energy loss thus proving to be a cost-effective strategy. This project gives solution for electrical power wastage. The system also includes the client-server mechanism where a user can directly interact with the web based application to manage the Street lamp of any place from the single position. Some street light control systems have been developed to monitor and reduce the use of power in town's public street lighting system.

II. LITERATURE SURVEY

A.   *Manual operation*

Usually street light remain ON in morning time due to manual operation which cause loss of energy and therefore this project is very beneficial for saving power and energy by automatic control.This circuit also provides the idea of developing the driver circuit of LED lamp which is widely used nowadays. The drawbacks in existing system is we can reduce energy consumption because the manually operated street lights are not switched off properly even the sunlight comes and also not switched on earlier before sunset. In sunny and rainy days, ON and OFF time differ noticeably which is one of the major disadvantage of using timer circuits or manual operation for switching the street light system *Automatic Street Light.*

B. *Automatic Solar Street Light*

An automatic control circuit of LED street lamp is designed. The circuit is supplied with solar cell and stored electric energy with battery. It has three working modes of light control, delay quenching and

delay plus low power. Under the light control mode, the LED street lamp is turned off in daytime and ON at night automatically. Under the delay quenching mode, the LED street lamp is turned off in daytime. It would be light at night automatically and turned off after the setting time. Under the delay plus low power mode, the LED street lamp is light at night automatically and changed into pulsed lighting in low power after the setting time. It would be turned off in daytime.The circuit also has the functions of protecting the battery from the over voltage or under voltage and automatic restoration of charging.The drawbacks in existing system generation of energy for solar street light entirely depends upon the climatic conditions.Risk of theft of the automatic street light system is relatively higher since they are non-wired & are much expensive.Rechargeable batteries of the automatic street light system are required to be replaced a few times.

III. INTELLIGENT STREET LIGHT

In the intelligent street light based on environmental behavior is to provide an efficient and energy saving lighting system by evaluating the outside lighting condition and then adjusting the lights accordingly.

● The circuit mainly consists of a sensing element known as LDR,IR which is followed by processing unit Arduino which takes input for sensing element LDR and gives its output to the LEDS (lighting units).

● The LDR senses the light and sends the data to Arduino. The Arduino analyse the data and gives its response to the LEDS .

● The Arduino is programmed in such a way it automatically adjusts the lights to give most accurate result possible.

IV. COMPONENTS REQUIRED

A. LIGHT DEPENDENT RESISTOR (LDR) SENSOR

Light Dependent Resistor as the name suggest the resistance is dependent upon the light incident on it. The light dependent resistor resistance changes with the intensity of light, with an increase in light intensity the resistance offered by the sensor decreases and with decrease in light intensity the resistance offered by the sensor increases.

Hence it acts as a variable resistor to change in light intensity. These help in finding the amount of light intensity at that instant of time and thus helping in regulating the lighting of our lighting system accordingly.

B. ARDUINO UNO

Arduino is an open-source physical platform based on the microcontroller board having the ATmega32 series controllers and Integrated Development Environment for writing and uploading codes to the microcontroller.

It has input and output pins for interaction with the outside world such as with sensors, switches, motors and so on. To be precise it has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller .It can take supply through USB or we can power it with an AC-to-DC adapter or a battery Arduino acts as the processing module of the system. It takes input from the LDR, process the data and gives the output to LEDS directly or through a relay and a transistor mechanism .

C. IR SENSOR WORKING MECHANISM

An IR sensor is basically a device which consists of a pair of an IR LED and a photodiode which are collectively called a photo-coupler or an opto-coupler. The IR LED emits IR radiation,reception and/or intensity of reception of which by the photodiode dictates the output of the sensor. Now, there are so many ways by which the radiation may or may not be able to reach the photodiode.

D. LEDS

A light-emitting diode (LED) is a pin junction diode, which emits light when activated. When we apply a voltage across its leads, electrons are able to recombine with holes within the LED, releasing energy in the form of photons which gives the light. Hence, it is a two-lead semiconductor light source Light emitting diodes represents our lighting system and the amount of light emitted by it is directly related to the amount of light in the environment that is when outside light is less than the light given by LEDS is more and visa-versa.

V. RESULT ANALYSIS

The IR sensor senses the person or any object is in movement at night time it 'will sense based upon the distance and the street light turns on.
The LDR senses the climate If the cloudy climate appears the lights will automatically switched ON otherwise it will be switched OFF.
Under the light control mode, the LED street lamp is turned off in daytime and at night automatically ON.

VI. CONCLUSION AND FUTURE SCOPE

Intelligent street light for smart city consumes the energy efficiently . It also reduces the manual work of controlling the lighting systems. The lights switched on if cloudy climate appears the lights will automatically switched ON Otherwise the lights will be switched OFF. Luminosity measurement is made by LDR and the intensity of the light is controlled so the power is utilized only when it is essential.

The future scope of it is tremendous as there are so many wonderful features added in these street lights that will keep one's jaws dropped.LED lights have more lifetime than HPS lights. This system

is comparatively cost efficient and reliable. The invention of these lights exactly helps in minimizing the amount of waste and reduces carbon footprints. The LED's used in these lights contains no toxic elements and so it helps to protect the environment from any toxic waste. The future of any city depends entirely on the value-added services,

- Mobile device charging points

- Button for emergency services
- Wi-Fi routers
- CCTV cameras
- Digital information display for traffic congestion
- Information on nearby parking spaces
- Charging stations for electric vehicles
- Inbuilt pollution monitors

VII. REFERENCES

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