Autonomous Distributed Controlled Light System

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***Abstract*:- In olden days, people used to turn ON the street lights when environmental light get dim. Nowadays, environment light can be detected by using LDR sensor and automatically switched ON/OFF the street lights. It is very usual to see the street lights being bright all the night, which is a major waste of energy in the modern world. In this work, we have to introduce a possible way to save energy in street lamps. Our research is focus on the roads which are rarely used or where there is less traffic. It manages "Identification the moving item continuously, while showing up locale, centre area, leaving district, the splendid express, the dim state", have been made. Infrared sensor is used to analyze the direction and volume of the vehicle in the roads. Sensor detects a vehicle, it sends message to the controller and the controller can act correspondingly. Due to the safety of the vehicle, the post lamps are in bright state when a moving object is detected. Otherwise the lamps will be in dull state to save energy. There will be a good distance visibility whose street lights will be bright before the vehicle arrived.**
The light intensity will be regulated according to traffic and c rowding.Ourresearch manages light sensors which will be helpful in blustery season and number of road lights will be constrained by the client at a remote spot. At top traffic time the lights will be running at 100% force and with diminished power after pinnacle traffic time.

Keywords: LDR, IR Sensor based automated street light system.

1. INTRODUCTION

The road light controller may be a more intelligent form of the mechanical or electronic gear already utilized for road light ON-OFF strategy. Suitable vitality productive street lighting system organizing least essentialness and get together necessities for detectable quality and real light levels, shrewd light advancements, best shaft stature and assignment, effective light scattering.

India, US, Canada, and numerous different nations have begun acquainting road light control framework with their street lighting for road light administration, vitality preservation and upkeep reason. It assists with lessening carbon impression and recoveries the earth. In most of the urban territories, the street lights are settled and kept up by districts. Generally urban and semi urban networks are up 'til now using a mix of fluorescent, CFL, high-pressure sodium lights or metal halide bulbs, that are not proposed to meet region insightful lighting prerequisites. Little investigation or approach has gone into the luminance needs in different zones of streets, to report the essentials of vehicular action and individuals by walking. For instance, the lighting necessities of vehicle action in fast regions are special from low-speed high development locale. Insufficient lighting framework junks significant monetary resources every year. Then again, the poor lighting framework can create hazardous conditions.

A superbly structured, vitality effective road light controller needs to permit individuals going around evening time with better clarity without any difficulty while diminishing vitality utilization and charges. This additionally should improve the nearness of the region. Populace and traffic stream around evening time isn't the equivalent each time. Urban street populace stream and traffic stream in the 18 o'clock to 12 o'clock is high in mean number yet following 12 in the night the traffic stream will be altogether reduce. Even after 2 am, the street is likewise uncommon of person on foot and vehicle. Be that as it may, urban street lighting has stayed at a high brilliance in 10 hours, expending gigantic measures of power, with the goal that the effectively tight vitality wards depleting off.

2. LITERATURE REVIEW

Steve Chadwick [1], reports on the 2 installation case studied in Scotland and Wales and explains the small print and benefits of the technology. The system was called as MINOS that had a diary of over 100,000 units installed and dealing successfully.

K. Santha et al [2] have surveyed on Street Lighting System Based on Vehicle Movements. The framework works inside the programmed mode which directs the streetlight steady with brilliance and shadowiness calculation and lightweight force. The control is often made consistent with the seasonal variation. It incorporates a period cut-out capacity and a programmed control design for saving greater power. The whole paper was implemented employing a PIC microcontroller.

M. Abhishek et al [3] have implemented design of traffic flow based street light control system with effective utilization of solar energy in the year 2015. They used the renewable source of energy i.e. the solar power for street lighting. They have also used 8052 series microcontroller and is developed by replacing the traditional bulbs with the LEDs thanks to which the facility consumption is reduced by 3 times. Sensors are placed on either side of the road which senses the vehicle movement and sends the commands to the microcontroller to switch ON and OFF the lights. Here all the road lights remain transitioned and it glows only it senses the vehicle movement. Hence, due to the microcontroller, even when its night the lights are transitioned.

S. Suganya et al [4] have proposed about Street Light Glow on detecting vehicle movement using sensor is a system that utilizes the latest technology for sources of light as LED lamps. It is also wont to control the switching of street light automatically consistent with the sunshine intensity to develop flow based dynamic control statistics using infrared detection technology and keep up remote correspondence among lamppost and control terminal utilizing ZigBee Wireless convention. It likewise consolidates different advances: a clock, an insight of traffic stream greatness, photodiodes, LED, power transistors.

Radhi Priyasree [5] explains a system to scale back the facility consumption of street lights by avoiding inefficient lighting which wastes significant financial resources annually. This is finished by diminishing the lights during less traffic hours. For the purpose PIR sensor is used which detects any movement. This work also aims at reducing the fatal crashes and road accidents caused thanks to alcohol consumption. This is finished utilizing skin sensors put in vehicle entryways and furthermore utilizing broadness sensors inside the vehicle. By implementing this death rates thanks to drunk driving are often reduced to an excellent extent. The prototype has been implemented and works needless to say and can convince be very useful and can fulfill all this constraint if implemented on an outsized scale. It also aims at detecting consumption of alcohol by the driving force and if it exceeds certain level it impairs the driving force from getting into the Vehicle. This avoids event of mishaps or any deadly crashes. This initiative will help the government to save lots of this energy and meet the domestic and industrial needs.

Srikanth et al [6] proposed a ZigBee based Remote Control Automatic Street Light System. The system is designed to assistance of ZigBee modules that helps in detecting the faulty lights and controls the sunshine. It also discusses about an intelligent system that takes automatic decisions for ON/OFF/DIMMING considering the vehicle movement or pedestrian and also the encompassing environment. PIR motion sensor is employed to detect movement of both living and non-living things.

C. Bhuvaneshwari et al [7] have analyzed the road light with auto tracking system by which one can increase the conversion efficiency of the solar energy generation. Here, the sun tracking sensor is that the sensing device which senses the position of the sun time to time and provides the output to the amplifier supported light density of the sun. Sun following sensor is LDR, enhancer unit is utilized to open up the LDR signals which changes over low level signals to tall level signals and in this way the yield is given to comparator. The LM324 IC is utilized as an intensifier. Comparator, compare the signals and produce the command to AT89C51 microcontroller.

Somchai Hiranvarodom [8] describes a comparative analysis of photovoltaic (PV) street lighting system in three different lamps. Namely, a coffee pressure sodium lamp, a high sodium lamp and a lamp are used for installation in each mast to work out the acceptable system to install in a typical rural area of Thailand. All three frameworks are mounted with the same module sort and wattage in a few places inside the Rajamangala Organized of Innovation, Thanyaburi area, Pathumthani territory of Thailand. An operation of solar street lighting system is often divided into 2 periods of your time, namely, at 18.00-22.00 hours and 05.00-06.00 hours. The design of an impact circuit was experimentally wiped out this work. The aim of this work is to work out the acceptable system to put in during a typical country or a typical rural village of Thailand.

From this literature survey, the methods all has implemented and used is straightforward and straight forward to know. These papers and journals has given many ideas to further implement a way efficient system and make things automated. The presentations are simple and clean with all the required information needed for a basic learner or reader.

3. EXISTING SYSTEM

Industry of street lighting systems are growing rapidly and getting to complex with rapid climb of industry and cities. Computerization, Control utilization and cost Viability are the vital considerations inside the show field of hardware and electrical related innovations. To control and keep up complex road lighting framework more financially, different road light control frameworks are created. These systems are developed to regulate and reduce energy consumption of a town's public lighting system using different technologies. The existing work is done using High-intensity discharge lamps.

Currently, the High-intensity lamp is employed for urban street light supported principle of gas discharge, thus the intensity isn't controlled by any voltage reduction method as the discharge path is broken. We have seen within the number of cities where the road lights are the one of the tremendous vitality cost for a city. Right now we have manual framework where the light will be exchanged ON within the evening some time recently the nightfall and they are exchanged OFF another day morning after there's adequate light exterior. So there's part of vitality squander between ON and OFF timing.

Disadvantages of Existing System:

- Manual switching OFF/ON of Street Lights.
- More Energy Consumption.
- High expense.
- More manpower.
- HID lamps devour more power.
- The life time of the Hid lights is exceptionally less.
- It cannot be utilized in all open air applications.
- Brightness of the lights in the rear see mirrors which causes a problem for drivers before your vehicle.

4. PROPOSED SYSTEM

Sensor unit

It consists of the motion sensor, LDR, the communication device and the controller It sends out the message to other units under the condition that motion is detected. This unit is put in numerous areas, such as at electric shafts, at house entryways, at house fence and interior or exterior of the entryway, to guarantee that each road light turns on some time recently people on foot take note that. As

for control supply, the sun powered battery can be a great choice.

LDR sensor

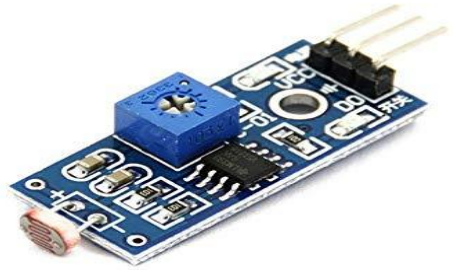

Fig.1 Prototype of LDR

A Light Dependent Resistor (LDR) or a photo resistor may be a gadget whose resistivity could be a work of the occurrence electromagnetic radiation. Hence, they are light sensitive devices. They are too called as photo conductors, photo conductive cells or basically photocells. They are made up of semiconductor materials having tall resistance. It depends on the light, when light falls on the LDR at that point the resistance diminishes, and increments within the dark. When LDR is kept in the dark place, its resistance is high and, when the LDR is kept in the light its resistance will decrease.

IR sensor

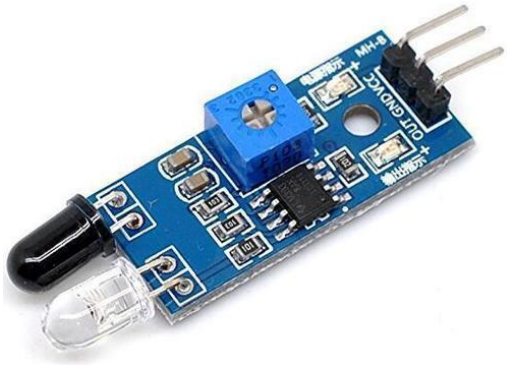

Fig.2 Prototype of IR

An infrared sensor is an electronic gadget, which produces so as to detect a few parts of the environment. An IR sensor can gauge the warmth of an article just as identifies the movement. These kinds of sensors measure just infrared radiation, instead of emanating it that is known as a uninvolved IR sensor. As a rule, in the infrared range, all the items emanate some type of warm radiation. These kinds of radiations are imperceptible to our eyes that can be recognized by an infrared sensor. The producer is essentially an IR LED (Light Emitting Diode) and the identifier is basically an IR photodiode that is delicate to IR light of a similar wavelength as that radiated by the IR LED. At the point when IR light falls on the photodiode, the protections and the yield voltages will change in relation to the greatness of the IR light got.

Interconnection unit

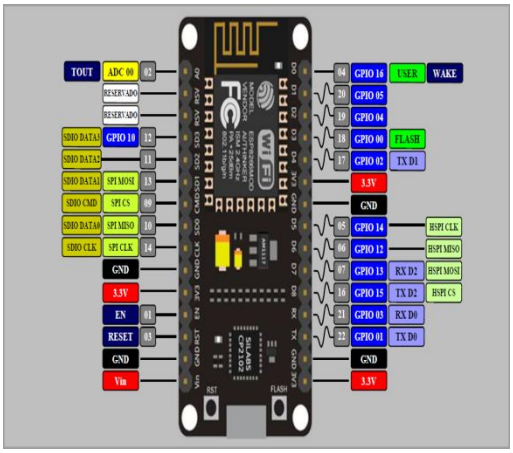

Fig.3 Block Diagram of Interconnection Unit

The node MCU Wi-Fi module is used to interconnecting both the sensing and display unit. The sensing and display units can be interconnected through MQTT protocol. MQTT is a machine-to-machine (M2M) "IOT" network convention. It stands for Message Queuing Telemetry Transport. It was planned as a very lightweight distribute/buy in informing transport. It is valuable for associations with remote areas where a little code impression is required and additionally arranges data transfer capacity is at a higher cost than expected. In this part acquired data is processed using Node MCU. The Wi-Fi based ESP8266, which is inbuilt in the Node MCU module. Here we use C language for programming node MCU. Node MCU will make decisions based on data given in sensor.

Display unit

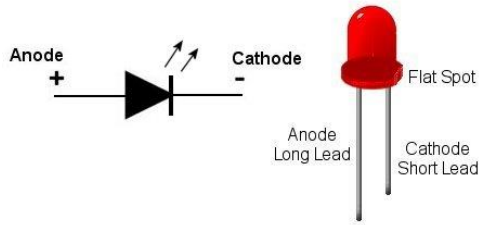

Fig.4 Components of Display Unit

It consists of power-adjustable LED array, the brightness sensor, the motion sensor, the communication device, such as Node MCU module, and the controller. It turns on for a few minutes beneath the conditions that a movement is recognized within the characterized zone by the sensors counting its claim sensor. At that point, it sends the message to other units. It turns off or reduced power under the condition that any motion is not detected in the defined area. LED plays a major role in the display unit. A light-emitting diode (Driven) could be a semiconductor light source that radiates light when current streams through it. It is one of today's most energy-efficient and rapidly-developing lighting technologies.

Block diagram

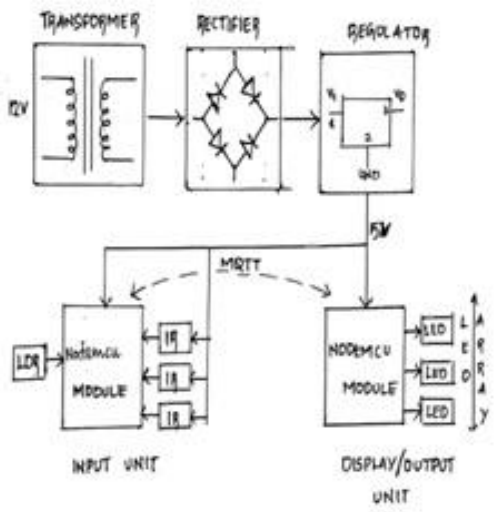

Fig.5 Block Diagram of Node MCU Module

It consists of a power supply, NODEMCU, infrared sensor, light dependent resistor, LEDs and connecting wires. NODEMCU is an in-build Wi-Fi module used for communication. To diminish control utilization and to realize security sensor part is vital. Consequently, to identify whether person on foot or vehicle is going on the road, the related framework is required to utilize.

In stormy season or bad-light condition, adequate light is required for visibility even in standard day time. With the help of power supply NODEMCU is activated and all sensors are also activated. When the motion is detected by infrared sensors then it sends a message to NODEMCU. Then the message is passes to the receiver side which consists of LEDs through MQTT protocol. After receiving the message of motion detection then the light glow bright. The lamp post or LED glows bright only when the motion is detected. The LED goes dull state, when there is no motion in that street or road.

5. ANALYSIS ON ENERGY CONSUMPTION

City street-lighting energy-saving system's energy consumption directly reflects the energy saving effect. The existing street-lighting program for the night lights are at rated power all night long, so the street lamp energy consumption on the road, which length is L, per unit of time at night can be simply expressed as,

$$w_0 = \frac{1}{1000} \times P_r \times T \times \frac{l}{s} \times 2$$

Where, l is the length of a straight line section (m); s is the spacing between two installed street lights (m); T is the unit of time (h); P_r is the rated power of a lamp (w).

According to "real-time detection, sub-control" design we can see the lighting consumption per unit time at night changes according to the changes of traffic flow and vehicle density in this section, in order to carry out the quantitative analysis and comparison with existing programs, now simplify the actual energy consumption per unit time into the arithmetic mean of the maximum possible power consumption and the smallest possible power consumption. Among them, the maximum possible power consumption means that the section of improvement of brightness is only concerned with one vehicle. Minimum possible power consumption refers to a section of street has as many as possible vehicles through the road, which the lamp in rated power has been the most fully effective used. Suppose in the minimum possible power consumption state the minimum interval of two vehicles is 10m, while ignoring vehicle length, this can be drawn:

$$w' = \frac{1}{1000}\left[P_{rated} \times \frac{l}{s} \times \frac{l}{2 \times 1000v} \times c + P_{dark} \times \frac{l}{s} \times \left(T - \frac{l}{2 \times 1000v} \times c\right)\right] \times 2$$

$$w'' = \frac{1}{1000}\left[P_{rated} \times \frac{l}{s} \times \frac{l}{1000v} \times \frac{c}{l/(2 \times 10)} + P_{dark} \times \frac{l}{s} \times \left(T - \frac{l}{1000v} \times \frac{c}{l/(2 \times 10)}\right)\right] \times 2$$

$$w = \frac{w' + w''}{2} = \frac{P_{rated} \times l \times c}{5 \times 10^4 \times s \times v}\left(1 + \frac{l}{40}\right) + \frac{P_{dark} \times l}{1000s}\left(2T - \frac{l \times c}{2000v} - \frac{c}{50v}\right)$$

Where, c is the average traffic volume (vehicles / h); v is the average speed of vehicles at night (km / h).

To compare the two programs calculating the energy difference can reflects the energy-saving of the design: road length is 2000m, streetlight installation spacing is 30m, 250w high pressure sodium lamp as light source, when it is in the dark state power is 150w, the average traffic volume the night 0 : 00 - 5:00 was 20 / h, average vehicle speed is 25km / h, the average electricity consumption of current program hourly is Wo = 33.33 kwh, our new design average electricity consumption hourly is W = 25.43 kwh. Above calculations indicate that the energy-saving rate the design is 'f/ = 23.7%, if the average price of electric charge is 6.72 rupees / kwh, the conservation of electricity a year in this road is 17301kwh (assuming using hours are 6 hours per day), that is saving 116293.07 rupees. Suppose that the whole country has 10,000 such road sections using this design, about 1.1 billion rupees can be saved. At the same time, less input needed for this program, it can bring substantial social and economic benefits.

6. CONCLUSIONS

This paper scheme is particularly applicable for street lighting in distant urban and rural regions where the traffic flow is low at eras. The individuality of the facility network licenses to implement it in distant regions where the normal schemes are excessively expensive. The system is flexible, extendable and entirely modifiable to user requirements. This paper is an economical, practical, ecological and the harmless way to save energy. It noticeably challenges the 2 difficulties that world face today, saving energy and also

the removal of glowing lamps very powerfully. According to statistical information we can save more than 35% of the electrical energy that is now consumed by the highways. Initial cost and maintenance can be the drawbacks of this paper. With the improvements in technology and good resource design the budget of the paper is often hamper and also with the usage of excellent equipment the upkeep can also be reduced regarding periodic checks. For these causes our paper presents much more benefits which may over shadow this boundary.

7. REFERENCE

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