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INTENSITY CONTROLLER OF LED STREET LIGHTS

Mr. Ashish V. Patil[1], Ms. Vasudha P. Nawade[2], Prof. K.P. Mahure[3]

[1,2]UG Scholar, Electrical Engineering, DESCOET, Dhamangaon (Rly.), Maharashtra, India.
[3]Assistant Professor, Electrical Engineering, DESCOET, Dhamangaon (Rly.), Maharashtra, India.

Abstract - *An Currently, Light Emitting Diode (LED) lamps are used mostly in street lights. Street lights are illuminated at full capacity throughout its duration, this results in a huge power loss. This paper discusses an intensity controller system, which solves the problem of power loss. The main aim of this paper is to run the street lights on low intensity when there is no one in the vicinity and turn on to full intensity when there is presence of individuals in the surrounding of the street light. The process of dimming the light according to the requirement of the public will result in saving of energy. The analysis of energy consumption with and without intensity controller is discussed. Also the proposed system is tested on a comparison basis with other proposed and existing system in order to conclude the better results among them.*

Key Words: LED, Intensity Controller, PLC.

1. INTRODUCTION

In recent scenario, the street lights we are using have large power consumption as a result there is need of optimization in our power system since we know that in India there is no power equality constrains i.e. power supply is not equal to demand so there is need of optimization in our power system. Currently use of sodium vapor lamps for street lighting is reducing, because of low power factor as well as poor voltage regulation. Because of this light emitting diode (LED) street lights came into existence. LED street lights are mostly used at the present time works on DC power supply. But these street lights are kept as open loop system in accordance with their operation and ends up consuming large amount of energy as per its utilization. The demonstrated a hardware which is based on static components and can be controlled by a digital input or a digitally operated switch which can save a significant amount of energy.

The system proposed in uses LED lamps for employing a light dimming system to save energy. This light dimming system is based on the decentralizing the street lighting from the main power grid by DC system. The study in gives technique to make street light system automated using light depending resistor (LDR) and microcontroller. LDR is used to detect the day and night condition and microcontroller is programmed to control the switching of street lights as per timer in the microcontroller. But this system is not totally intelligent and range of operation is limited. The system is uses Arduino and other software to achieve same objective as per the system proposed in this seminar. Another system uses microcontroller for switching of LED Street lights during night hours to make the street light system automated.

The system proposed in this seminar cover up limitation from above different system such as high initial cost, limited range of inputs, complexity, and manipulation of intensity of street lights. Also the intensity controller discussed in this seminar is having less cost and feasible for long range of operation. The efficient use and saving of energy is the first and the foremost objective our proposed system. Along with the saving of energy reducing the cost and increasing implementation ease are also the points of concern which are discussed in this seminar. The system using communication of sensors mounted on street lamp pole or nearby to effectively illuminate the lamps according to the requirement at a particular location than the other. The system discussed in this seminar is far cheaper and even if it has a less sophisticated control than the communication module system, it can be implemented on a large scale. Hence it gives a considerable amount of energy saving.

The algorithm proposes an idea of diming the street light for a time span of 11.30 pm to 4.30 am when there is assumed to be less presence of peoples on the street. This algorithm is hard coded in the processor and should be used repetitively. Comparing this path of optimization, the system proposed in this seminar is more adaptable to change as we have liberty of using a sensor for the input of switching unit which gives output according to the real time physical condition which will be more effective and of less restrictions in use than a onetime initialized, hard coded algorithm which based upon time and remain the same once implemented and any modification will be difficult.

2. OVERVIEW OF SEMINAR

2.1 Intensity Controller System

This seminar discusses an intensity controller system, which solve the problem of power loss. The main aim of this seminar is to run the street lights on low intensity when there is no one in the vicinity and turn ON to full intensity when there is presence of individuals in the surrounding of the street lights. The study in gives technique to make street light system automated using light depending resistor (LDR) and microcontroller. LDR is used to detect the day and night condition and microcontroller is programmed to control the switching of street lights as per timer in the microcontroller. In this seminar another system uses microcontroller for switching of LED Street lights during night hours to make the

street light system automated also this system having less cost.

2.2 PIC16F877A Microcontroller

The PIC microcontroller PIC16F877A is the most useful microcontrollers in this seminar. The main advantages of this is it can be write erase as many times as possible because it uses flash memory technology. It has a total number of 40 pins and there are 33 pins for input and output as shown in fig. 2.2.

Fig. 2.2: PIC16F877A Microcontroller

A microcontroller is a computer control system of single chip. There are many electronic circuits built into it, which can decode written instructions and convert them to electrical signals. The microcontroller are use to step through these instructions and execute them one by one. The example of this a microcontroller we can use it to controller the lighting of a street by using the exact procedures. Microcontrollers are now changing electronic designs. Use of hard wiring a number of logic gates together to perform some function we now use instructions to wire the gates electronically.

2.3 PLC

PLCs are use to monitoring the inputs continuously from sensors and producing the output decisions to operate the actuators based on the program. They are user friendly and easy to logic and fast. The basic functioning of the PLC re use control logic or the programming technique used.

PLC consists of a few different components such as input and output modules (I/O), a power supply, programming device and central processing unit (CPU). The CPU has memory for logic functions and data tables for I/O storage. The PLC system is shown in fig. 2.3. operate also they eliminate the need for hard wired relay

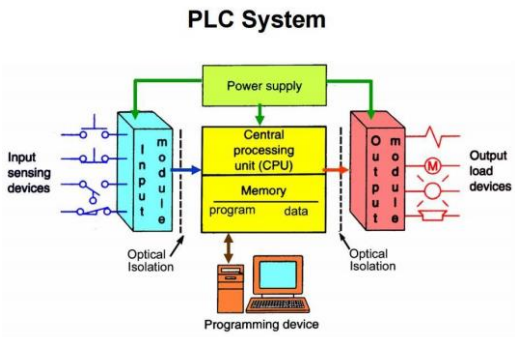

Fig. 2.3: PLC System

The CPU are use to starts reading the data from the input module and checks the status of all the inputs. According to the program this process continues as long as the PLC is in run mode.

2.3 IR Sensor

IR sensor is an electronic device which is used to sense heat and objects. Its works with the sensing of IR radiations and variation in heat.

These are as shown in fig. 2.3 the applications of the infrared sensors involve from domestic devices to industrial devices. These sensors are used in object sensing, motion detectors, obstacle avoidance robot, gas leakage detection, smoke detection, and measurement of distance, robotics and many more.

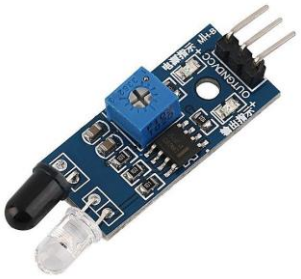

Fig. 2.3: IR Sensor

3. CIRCUIT DESCRIPTION

3.1: Bright Mode

When obstacle emanate in front of IR sensor, SW1 is turned ON and capacitor C3 starts charging shown in fig. 3.1 Here resistor R2 plays very important role, it defines the time constant of RC circuit. Smaller the value of R2, lesser is the charging time of capacitor.

When SW1 is ON capacitor starts charging and current flows through the base of transistor Q1 (2N2222). Due to this transistor starts working as a switch i.e., it works in

saturation and cut off region. Hence complete 20 V voltage is applied to the LED light and LED light is turned on with full brightness.

When obstacle passes the IR sensor switch SW1 is turned off and capacitor starts discharging through transistor Q1. As per the designed value of RC circuit capacitor takes that much time to discharge. During the discharging of capacitor C3 LED light remain ON with full intensity shown in fig. 3.1

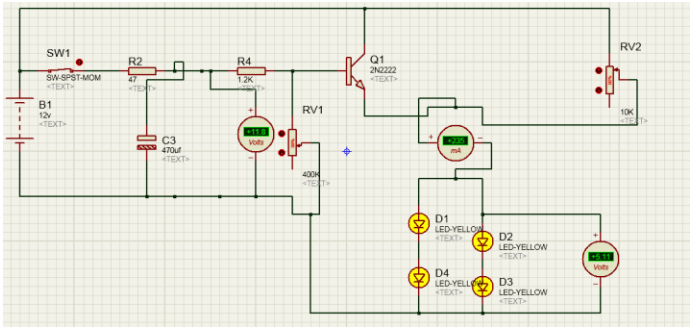

Fig. 3.1: Bright Mode

3.2: Fade Mode

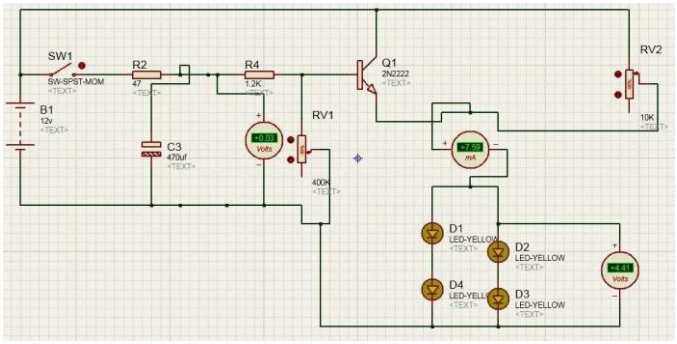

Fig. 3.2: Fade Mode

For this we considered following events which are in combination comprises the overall behavior of passerby's.

i) 30 times any random person is near the street light for 5 seconds each which makes the switch unit ON.

ii) Two measure disturbances for 10 minutes each.

After discharging capacitor of C3 transistor is turned off and LED light is made turned ON fade mode shown in fig. 3.2 the fade mode current to the LED can be adjusted by using potentiometer RV2. Therefore, proposed system can be used control the intensity of LED street lights and to save energy and energy cost. As per the designed value of RC circuit capacitor takes that much time to discharge. Due to this transistor starts working as a switch i.e., it works in saturation and cut off region. Hence complete 20 V voltage is applied to the LED light and LED light is turned on with full brightness

4. OPERATION

A 20 V battery is used as DC source and for sensing the obstacle, sensor unit is used which is Infrared (IR) sensor. For interfacing the sensor unit and intensity controller PLC or Arduino can be used to make the brightness control of LED lights automated. By implementing correct logic in PLC, the digital output of PLC can be made high to operate SW1. Fig. 3 shows the block diagram of proposed system.

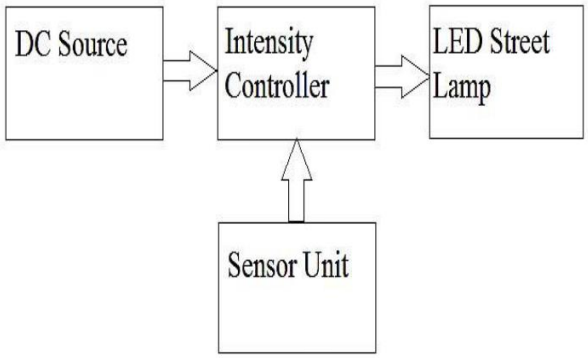

Fig. 3: Block Diagram of Proposed System

REFERENCES

[1] Noriaki Yoshiura, Yusaku Fujii, Naoya Ohta, "Smart street light system looking like usual street lights based on sensor networks", 13thInternational Symposium on Communications and Information Technologies (ISCIT), 2013.

[2] Abhilasha Jain, Chandrasekhar Nagarajan, "Efficient Control Algorithm for a Smart Solar Street Light", 9th International Conference on Next Generation Mobile Applications, Services and Technologies, 2015.

[3] R. Swathi C A, Hemanth Kumar S, Annappa A R, "Smart Street Lighting System Based on Sensors Using PLC and SCADA", Proceedings of the2nd International Conference on Current Trends in Engineering and Management ICCTEM -2014, 17 – 19, July 2014, Mysore, Karnataka, India.

[4] Hussain A. Attia, Amjad Omar, Maen Takruri, "Design of Decentralized Street LED Light Dimming System" Department of Electrical, Electronics and Communications Engineering/School of Engineering American University of Ras Al Khaimah, Ras Al Khaimah, UAE.