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Intelligent system for Highway street lights

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***Abstract*— In today's world. Microcontroller based control systems are gaining more importance, because of their number of advantages over the manual control system. The microcontroller based control systems are more reliable, accurate and easily programmable. Hence they allowed user to perform data transfer, data security, design the control system and tracking the changes in the system. We have placed IR sensors on the either side of street lamp in order to sense the presence of vehicles. When any vehicle crosses the IR signal which is send by IR module's transmitter. It reflects back the signal which will be received by IR module's receiver. This event will be tracked by Microcontroller. This will turn ON the street light along with preceding and succeeding lamps for limited pervade of time.**

***Index Terms*— Microcontroller, IR sensors, LDR sensor**

I. INTRODUCTION

India faces major problem regarding electricity i.e. its rate of generation of electricity is less than rate of consumption. Even small implementations can make large contributions on large scale .we know in this era of development more and more numbers of highways, expressways etc. thus an automation is needed to improvise the working of street lamps on this ways.[1]

This paper prototypes system in which complete automation of Highway Street light is possible. This prototype uses LDR as day night activation switch for Lamp, but this is not only the automation but by using IR pair lamp will be switched on only for a particular pervade of time i.e. only when vehicle passes by the sensor. By implementing this with many highways lights will be on only for short time thus improving efficiency

In the prior automation system i.e. only using LDR the system could only reduce the manual switching, but power saving could not be handled. Since the lamp were switched on throughout the night.[2]

II. SYSTEM ARCHITECHTURE

System has basically two major hardware parts i.e. day night detection and vehicle detection.

LDR is used to detect day and night, LDR is placed at the highest possible point of street lamp thus ensuring that is not false triggered by light from headlamps of vehicles. Following image shows the position of LDR on lamp. [3]

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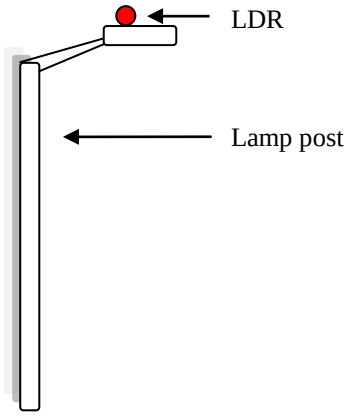

Fig 1 LDR position on lamp

The second part of the prototype concerns with vehicle detection for this purpose IR modules have been used, the response generated by IR will trigger three lamps simultaneously detected lamp, preceding and the succeeding. Following figure gives the working of detection automation.

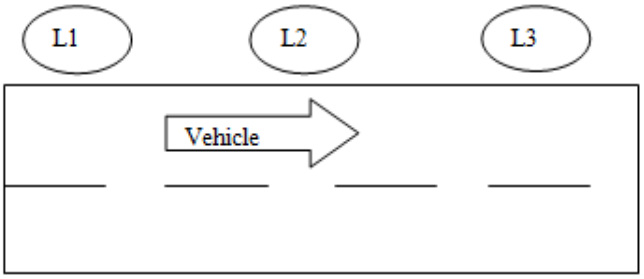

Fig 2 vehicle detection on road

When the vehicle passes by any lamp post it must have crossed previous lamp thus the present lamp will be on by response from previous lamp, the detection at current position will be lead to increase the time for current lamp and switch on the succeeding lamp.

III. FUNCTIONAL BLOCK DIAGRAM

Following figure represents the block diagram of the system. It comprises of 5 blocks out of which PIC microcontroller works as the brain box of the system both IR modules are connected to the controllers input. LDR is connected to one of the analog inputs so that switching may take place according to adjustable intensity.

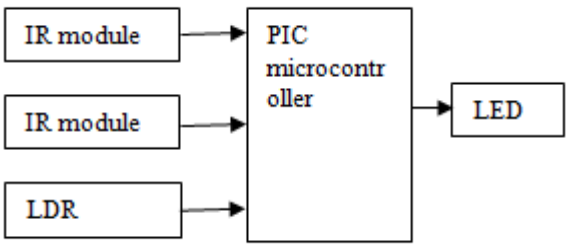

Fig 3 Block Diagram of system

IV. HARDWARE IMPLEMENTATION

PIC 877A is manufactured by Microchip, it is easily available in market, it operates on 5v supply. The main features are it 10bit ADC, with 8 channels inbuilt.

LDR acronyms for Light Dependent Resistor, as light increases resistance decreases, this is feed to Analog input of controller the controller is program feed with previously calibrated value thus it is able to control the operation.

Hardware modules include basically IR modules, IR modules used here are TSOP-OBSD is basically proximity detector here we use it as collision detector. This module continuously transmits IR beam, when ever any object crosses it the beam gets reflected back and is incident on IR receiver which then it toggles it output high. This event is detected by the microcontroller and thus it toggles control of lamp.

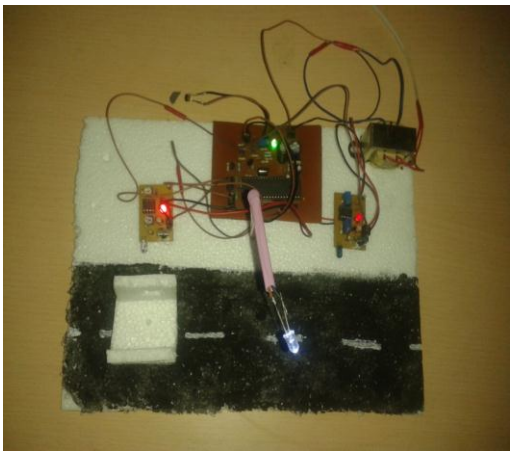

Fig 4 Hardware

The major part is giving control input, multiple lamps i.e. succeeding and preceding lamp will have 3 incoming inputs, solution to this problem is 3 inputs OR gate IC each input of OR gate will have signal from 3 controllers, one from its very own, pervious and next lamp.

V. RESULT

Following table gives the behavior of system in various situations

Time	IR detection	
Day	Not applicable	Lamp off
Night	No detection	Lamp off
Night	Detected	Lamp on

Table I

Analysis of system , if implementation for a stretch of 1Km road, suppose there are say 20 lamps at a distance of 50M each,

For a normal system, manual switching from 6.30 pm to g 6.30 am.

20 lamps are on for a period of 12 hours,

Considering the wattage for each lamp is 1 Watt/hour.

Total=no of lamps *watt per hour *working hours

Total=20*1*12=240Watts per day.

For the automated system lets consider 2 cases heavy traffic and very light traffic.

Case 1: heavy traffic

The road is continuously having vehicles, power consumption will be,

Total=20*1*12=240Watts per day.

Case 2: light traffic, a very few vehicles pass by this road,

For a highway minimum speed can be considered as 30 kmph,

So it takes 2 min to cover stretch of 1km for light traffic of 100 vehicles it would take 200 minutes i.e.3 hours 20 minutes

Total= 20*1*4=80 Watts

Thus in any of the cases the system in this paper is capable of saving electricity.

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