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ENERGY EFFICIENT SMART TRAFFIC MANAGEMENT

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Abstract

In today's world population is much increased. As much as population increases the needs for them also increases. The need for food, water, energy, current etc… also gets increasing. In this project we have designed an automatic morning and night detected smart traffic management system. This uses an LDR Sensor for detecting morning & night and Infrared Sensor to detect moving objects. i.e. this project is about intensity based traffic light control and object detected street lights control using infrared sensor. Hence the power consumption and energy is much reduced and saved.

Keywords: LDR Sensor, Infrared Sensor, AT89S52 Microcontroller, LED's, LCD, Crystal Oscillator.

I. Introduction

Introduction: Population in today's world is much increased; so the needs for them also gets increased. Mostly nowadays current and energy is widely used. The need for them is increased day by day. So we have designed a smart traffic management system to reduce the power used by traffic lights and street lights. This uses an LDR Sensor for detecting morning & night and Infrared Sensor to detect moving objects. Thus the power and energy consumption is much reduced.

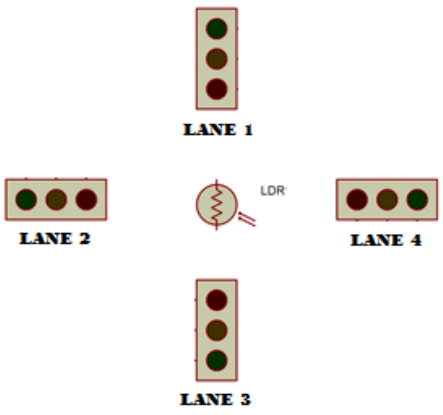

Fig. 1 Construction of the project.

The infrared sensor we used here is used to control traffic lights according to intensity in day and object detected street light controlling in night. The same infrared sensor is used for both traffic light control and as well as street light control. So to identify day and night, we used a light dependent sensor module which detects light and gives its output. In day time it will be off and in night time it will be on. It uses a light dependent resistor for detecting light. If the output of LDR sensor is low, it means that it is day time and it controls traffic lights and if the output of LDR sensor is high, it means that it is night time and it controls the street light. According to the LDR sensor the infrared sensor operates. This project has four lanes namely lane1, lane2, lane3, lane4. All the lanes contain a pair of infrared sensor.

We have used AT89S52 microcontroller for this project. It consists of four ports. Four pair if infrared sensors are connected in 4 pins one port; four lane traffic lights in port; Four Lane Street light in one port. We have also used an LCD display for displaying the lane which has more traffic.

II. Flowchart of the Project

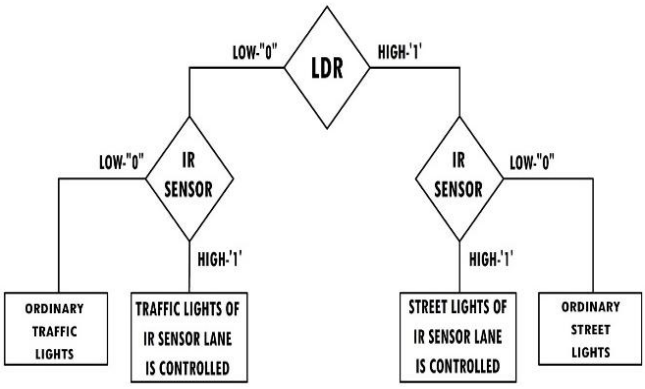

Fig.2 Flowchart of the project.

III. Hardware Tools Used

- AT89S52 Microcontroller
- Light Dependent Resistor
- Infrared Sensor
- Light Emitting Diode
- Liquid Crystal Display
- Crystal Oscillator
- Capacitors

- Resistors

IV. Software Used :

- Keil µVision
- Proteus (for Simulation)

V.Description :

A. AT89S52 microcontroller

The AT89S52 is an easy-to-use, low-cost, and multipurpose microcontroller. It's ideal for projects that require more than an assortment of logic gates, but less than a complete desktop computer system with a full keyboard, display, and disk drives. With a few support chips and a program stored in memory, we can use the AT89S52 to sense, measure, and control processes, events, or conditions.

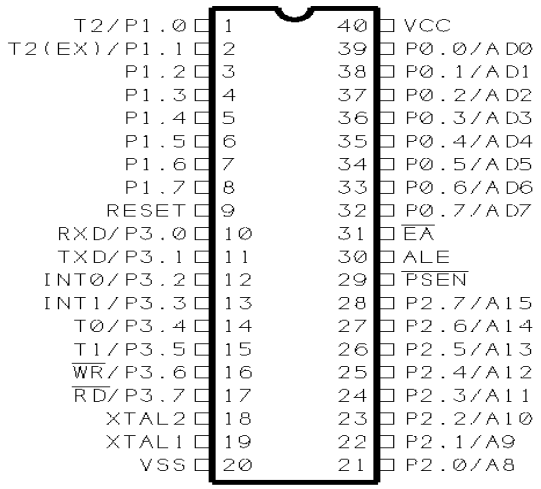

Fig. 3 Pin Diagram of AT89S52.

This microcontroller has four ports and each port contains 8 pins. All the ports can be accessed as input or output. The output from the IR Sensor is given to port 1 of microcontroller. The traffic lights are connected in port 0 and street lights are connected in port 2 of microcontroller. As we already explained that the same IR Sensor will act as both intensity measuring and object detecting. Also the LDR is connected to port 1(P1^4 pin) and the LCD is connected in port 3 of AT89S52 microcontroller.

B. LED

A light emitting diode (LED) is one of the best optoelectronic device which can emit a fairly narrow bandwidth of visible or invisible light.It emits light when the internal diode junction isprovided a forward electric current or voltage. The

visible colors that are emitted by an LED will be usually orange, red, yellow, or green. The invisible light comprises the infrared light. Here in this project we have used both color LED's as well as infrared LED's. Traffic lights in this project contains color LED's such as Red and Green whereas the Intensity measurement and object detection sensors use Infrared LED.

Street light used here are high bright white color LED's.

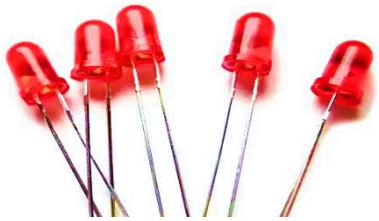

Fig. 4 Light Emitting Diodes.

C. IR Sensor

A sensor is a device that converts physical varying parameters to digital form. IR Sensor is used to detect the objects before it.

D. IR LED and Photodiode

IR Sensor consists of two diodes in it. One is the Transmitter diode known as IR LED and the Receiver diode known as the Photo Diode. Invisible rays are transmitted from IR Led, which in turn reflected back to photo diode if it falls on any object. This photo diode receives the rays and converts to electric current in binary form.

Fig. 5 IR Sensor.

E. LM 358 IC

LM358 IC is a Dual Op-Amp IC which performs some mathematical calculations with a single power supply. Here we are going to use this as a comparator as it compares white and black surfaces. Most of the Infrared Sensors will reflect rays if and only if the color tone of the surface is light colored such as white. Dark color will not reflect any transmitted rays. e.g. Black color.

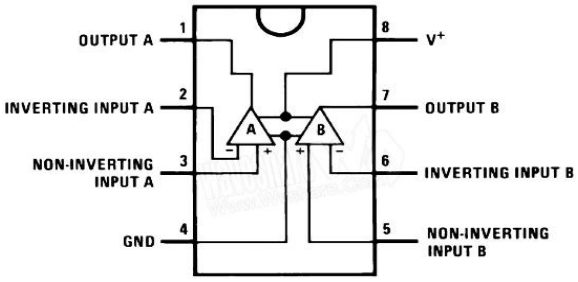

Fig. 6 Pin configuration of LM 358 IC.

F. Voltage Regulator 7805:

Voltage regulator is an electrical component which can able to maintain a constant output voltage even if the input applied to it varies. To make the output voltage of voltage regulator efficiently better, the input voltage applied to it should be greater than its output voltage which can be seen on top of voltage regulator IC. Here we are using 7805 voltage regulator IC; so it can able to give a constant output voltage of 5V if the input voltage applied to it is greater than 5V.

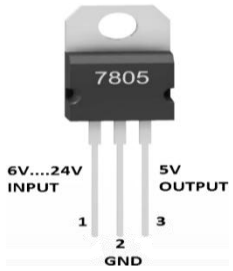

Fig. 7 Voltage Regulator 7805,

G. 16x2 LCD:

LCD's are used for better understanding between the machines which executes the program and to the humans. Here we have used LM016L LCD which has 16 column by 2 row that can be connected to the circuit either by direct connection (the lines of the LCD are driven directly by the pins in the ports of microcontroller) or as a memory-mapped device. This is useful in explaining communication with external devices by controlling individual I/O lines. The detailed description of LM016L LCD is given below.

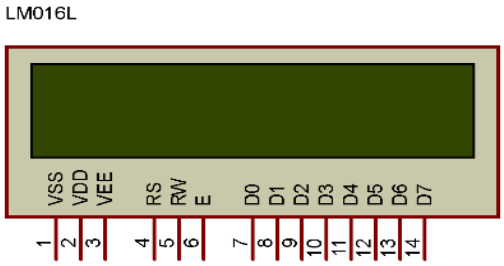

Fig.8 LCD.

VI. Circuit Diagram

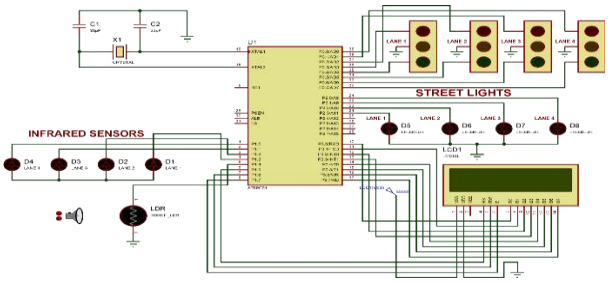

Fig. 9 Circuit Diagram of the Project.

VII. Working

In day time:

According to the intensity of traffic in lanes, the traffic light in the corresponding lane is controlled. e.g. If the traffic is more in lane 3 the output of infrared sensor in lane 3 will be high and the traffic light of lane 3 becomes GREEN and other lanes will becomes RED. So in day time infrared sensor acts as intensity based traffic light controller. And also, if more than one lane has high traffic density, the GREEN light will remain high until the traffic gets cleared in that lane, then control goes to other lane. So in day time infrared sensor acts as density based traffic light controller.

In night time:

Same infrared sensor is used for street light controlling in night. Traffic lights will work ordinarily in night, since there will be more traffic in morning than night. So the main motto is to save energy by reducing the power consumed by street lights. If the sensor detects any moving object the street light in that lane becomes high. e.g. If there is any moving object detected in lane 3, the infrared sensor becomes logic high and the street lights of lane 3 will glow. So in night time infrared sensor acts as object detected street light controller.

VIII. Uses

- By using object detected Street Lights Energy and Power consumption is much reduced.
- If we use LED's in Street Lights instead of ordinary street lights we can save more power consumption.
- Today traffic is the main problem in cities. So traffics in cities can be controlled.

IX. Advantages:

- Power Consumption is less. So we can save power and use them for another purpose.
- Cost efficient circuit.

- Cost Reduction by power consumption.
- Same IR sensor is used for controlling both density based traffic light control and object detected street lights control. So no compelling reason to go for more sensors for various controlling strategies.

X. Future Scope:

- We can reduce the use of LDR and we can use DS1307 RTC for controlling the circuit with real time clock.
- In advance we can use Ultrasonic sensors instead of infrared sensors.
- We can control traffic lights by program the microcontroller in such a way that how much density is measured by the Ultrasonic Sensor.

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