MINI PROJECT
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RAJALAKSHMI ENGINEERING COLLEGE, CHENNAI

DENSITY BASED TRAFFIC CONTROL SYSTEM

Presented by

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Abstract

In present, vehicular traffic is increasing throughout the world, especially in large urban areas. As the number of road users increase constantly and current resources & infrastructures being limited; a smart traffic control will become a very important in the future. These needs have led to an ever-increasing demand for an “intelligent” traffic control system. Therefore, optimization of traffic control to better accommodate this increasing demand is needed. Our project will demonstrate the optimization of traffic lights in a city using wireless sensors. Traffic light optimization is a tough problem. With multiple junctions, the complexity increases as the state of one light node influences the flow of traffic towards many other nodes. We proposed a traffic light controller that allows us to control and study different situations of traffic density. We sense the density of traffic using infrared sensors. The key role behind the implementation of the “Density based traffic control system” is to make use of and Arduino Nano (ATmega328) microprocessor which performs processing of the real time data provided by the infra -red sensors, eventually controlling the traffic flow via the LED traffic lights

Objective

- To reduce the traffic congestion and unwanted long time delay
- To evaluate and clear the density of vehicles which are fixed within a fixed space using IR SENSORS.
- The main purpose is, if there is no traffic on the other signal, one shouldn't wait for the signal. The system will turn green when there is no traffic.

Literature survey

A dynamic and automatic traffic light control system for solving the road congestion problem

Published in WIT Transactions on The Built Environment, Vol 89 in 2006

W. WEN in his paper has proposed a framework for a dynamic and auto traffic light control system They paste RFID tags on cars and thus RFID refers to make note of that number of cars, average speed etc. and store in a database by passing the formation wireless. This database is later used to control the traffic signal lights, which helps in reduction of traffic congestion

Intelligent Traffic Control System

Published in IEEE International Conference on Signal Processing and Communications, IEEE-2007 in 2007

JUBAIR MOHAMMED BILAL and DON JACOB proposed an intelligent traffic control system. In metropolitan cities, traffic is one of the major concerns nowadays. This system works on the simple principle that a car will be able to move only if a space is available for it to do so and the signal will remain unchanged until all the cars in the lane have passed. With the use of sensors at every junctions it is possible to efficiently control the traffic.

Intelligent Traffic Light And Density Control Using IR Sensors And Microcontroller

Published in International Journal of Advanced Technology & Engineering Research (IJATER) in 2012

PROMILA SINHMAR has proposed in her paper a solution to reduce the number of traffic jams with the help of IR transmission and microcontroller. The IR transmitter and receiver is to count the number of vehicles passing and decision to change the traffic delay is done by microcontroller based on the collected formation.

A Number of intelligent transport system technologies were developed for safe and easy transportation. They vary from bank management system such as CCTV system, triangular method, GPS based traffic system Bluetooth detection and sensing technologies.

Intelligent Traffic Light Flow System Using Wireless Sensors Networks

Published in JOURNAL OF INFORMATION SCIENCE AND ENGINEERING, Vol 26 in 2010

KHALIL M. YOUSEF, JAMAL N. AL-KARAKI and ALI M. SHATNAWI in his paper has developed an adaptive traffic control system based on a new traffic infrastructure using wireless sensor network using new techniques for controlling the flow of traffic. They also developed an intelligent traffic control to control the operation of the traffic infrastructure supported by WSN (Wireless Sensors Networks).

These techniques are dynamically adaptive to traffic conditions on both single and multiple intersections. A WSN is used as a tool to instrument and control traffic signals roadways. The controller embodies traffic system communication algorithm (TSCA) and the traffic signals time manipulation algorithm (TSTMA). Both algorithms are able to provide the system with adaptive and efficient traffic estimation represented by the dynamic change in the traffic signals' flow sequence and traffic variation.

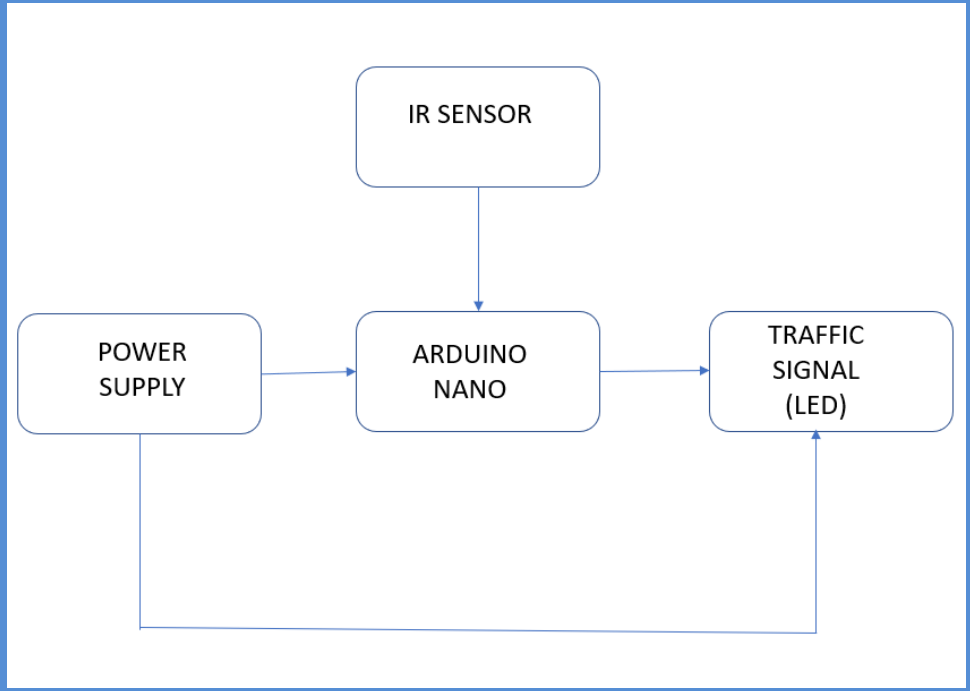
It senses the traffic and dynamically changes the traffic lights through wireless transmission. It only adds convenience to already existing traffic light system and not safety.

Street Light Glow on Detecting Vehicle Movement

Published in Journal of Network Communications and Emerging Technologies (JNCET) in 2018

ARAVIND SRIRAM, PRAVEEN KUMAR D and VISHNUDHARA SINI S proposed a system to glow street lights on detecting Vehicles. A large amount of electricity of many towns and cities is being expended in the all night street lighting systems. Street lighting systems are indeed very necessary, but in most of the areas the traffic density is very low during the late hours and midnight, there would be a huge waste of electricity resulting from such places if the streetlights are left unused. The main objective of this paper is to save energy, and by doing so we would be able to lighten few more houses. In this paper we focus to reduce the wastage of unused electricity by using automatic street light based on vehicle detection. This system uses a microcontroller (Arduino) to switch on the street lights depending on the vehicle or object detection. Also, since the lights don't stay on the whole night, the lifetime of the streetlights gets enhanced

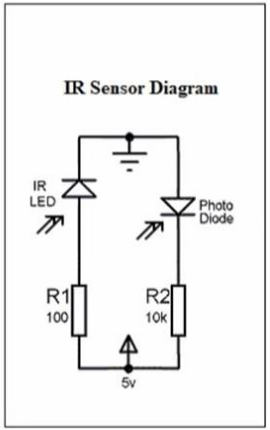
Block Diagram

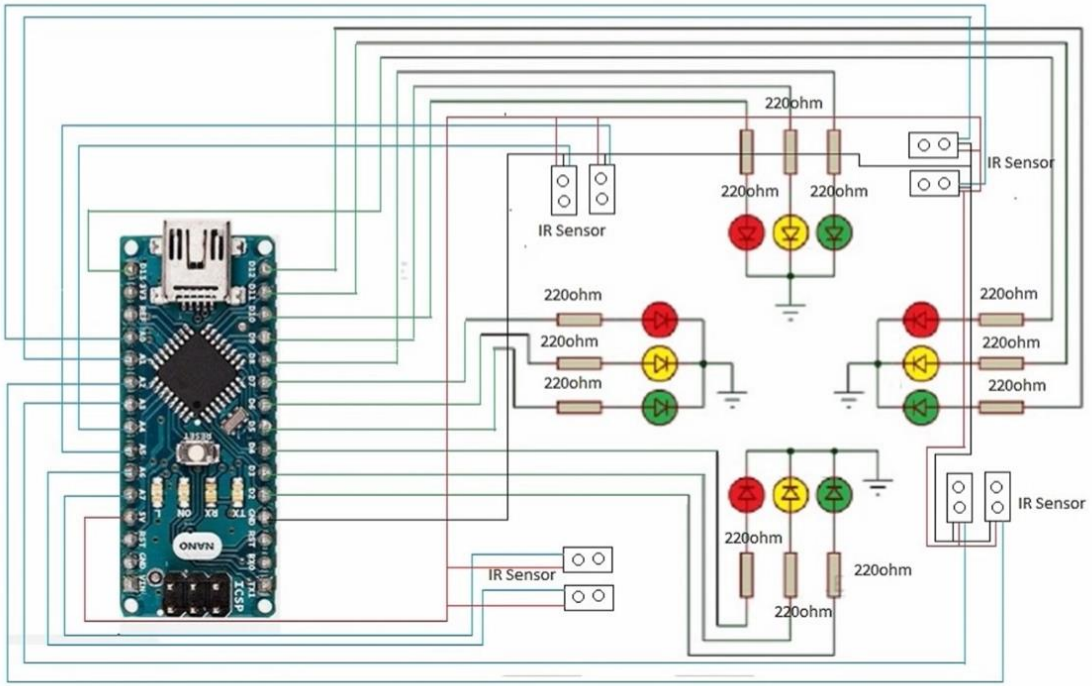


Working

In this system, we will use IR sensors to measure the traffic density. We have to arrange two IR sensor for each road, these sensors always sense the traffic on that particular road. All these sensors are interfaced to the microcontroller, Arduino Nano. IR sensors gives output HIGH if the traffic density is more and gives output LOW if the traffic density is low. Based on the output given by the IR sensors, the microcontroller processes the data and switches the traffic signal accordingly. If there are no vehicle in a certain lane, the traffic signal in that lane remains RED. If there is heavy traffic in a certain lane, the traffic signal remains GREEN for certain time so that the traffic is clear.

Circuit Diagram



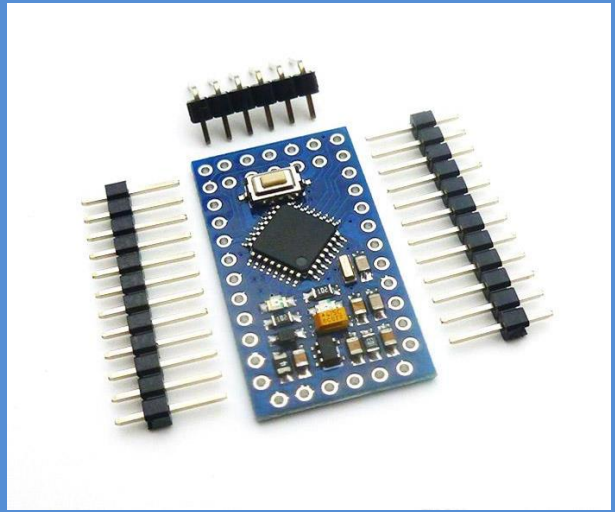


Components Required

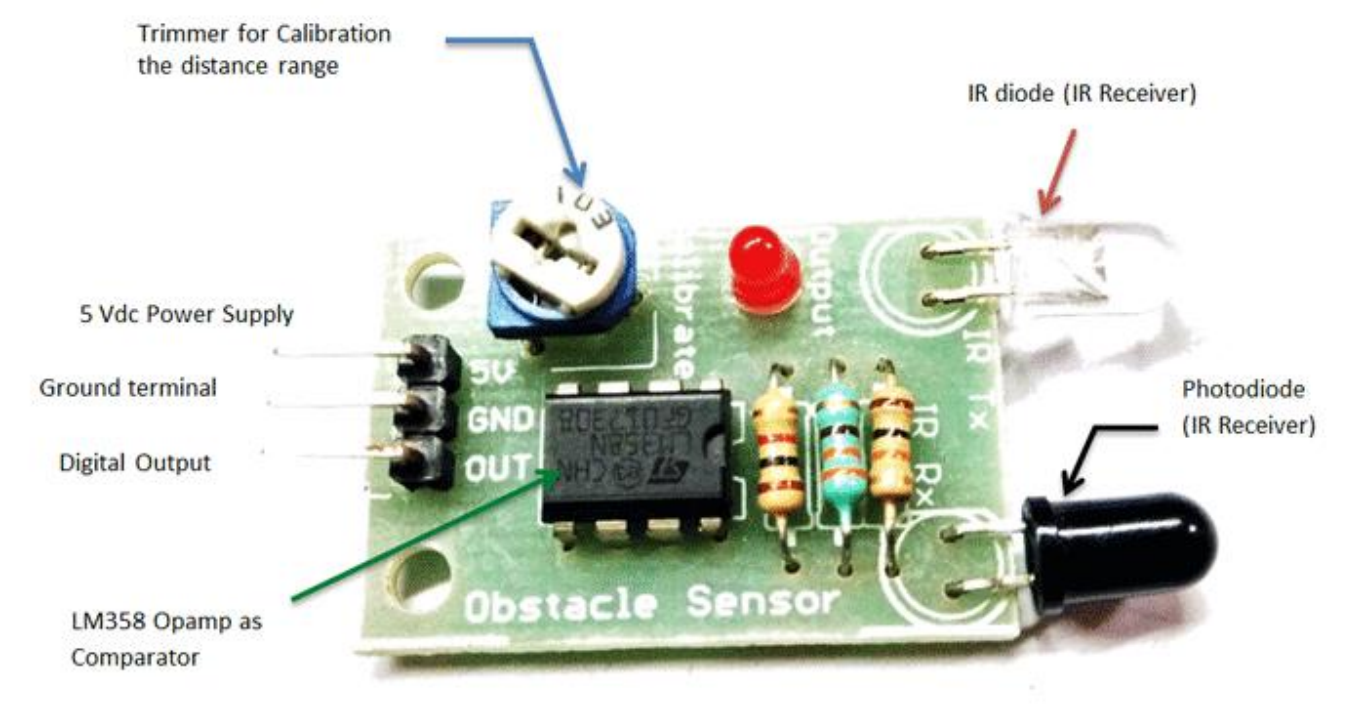
- ATmega328 microcontroller (Arduino Nano)
- PCB board
- Infrared sensors
- 12V Battery or 12V DC Adaptor
- Light Emitting Diodes (LED)
- Resistors
- Serial cable and
- Connecting wires

ATmega328 microcontroller (Arduino Nano):

- The ATmega328 microcontroller is otherwise known as Arduino Nano.
- It is a single-chip microcontroller created by Atmel in the megaAVR family
- It has a modified Harvard architecture 8-bit RISC processor core
- Operating Voltage - 5V
- Number of Analog Pins - 6 (A0-A5)
- Number of Digital Pins - 14 (Out of which 6 provide PWM)
- Frequency (Clock Speed) - 16 MHz



IR Sensors


Trimmer for Calibration
the distance range
IR diode (IR Receiver)
5 Vdc Power Supply
Ground terminal
Digital Output
Photodiode
(IR Receiver)
LM358 Opamp as
Comparator
5V
GND
OUT
IR Tx
IR Rx
Obstacle Sensor

IR Sensors

- 5VDC Operating voltage
- I/O pins are 5V and 3.3V compliant
- Adjustable Sensing range
- Built-in Ambient Light Sensor
- 20mA supply current
- Mounting hole

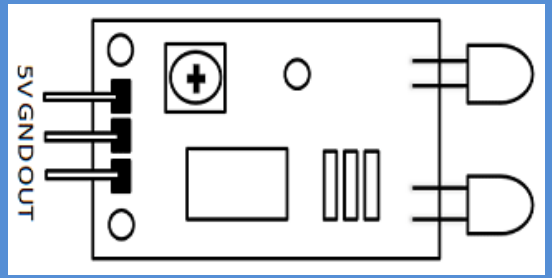
IR LED Transmitter - IR LED emits light, in the range of Infrared frequency. IR light is invisible to us as its wavelength (700nm – 1mm) is much higher than the visible light range. IR LEDs have light emitting angle of approx. 20-60 degree and range of approx. few centimeters to several feets, it depends upon the type of IR transmitter and the manufacturer.

Photodiode Receiver - Photodiode acts as the IR receiver as its conducts when light falls on it. Photodiode is a semiconductor which has a P-N junction, operated in Reverse Bias, means it start conducting the current in reverse direction when Light falls on it, and the amount of current flow is proportional to the amount of Light. This property makes it useful for IR detection.

IR Sensors

LM358 Op Amp - LM358 is an Operational Amplifier (Op-Amp) is used as voltage comparator in the IR sensor. the comparator will compare the threshold voltage set using the preset (pin2) and the photodiode series resistor voltage (pin3).
Photodiode series resistor voltage drop > Threshold voltage = Op Amp output is High
Photodiode series resistor voltage drop < Threshold voltage = Op Amp output is Low

Variable Resistor - The variable resistor used here is a preset. It is used to calibrate the distance range at which object should be detected.



- VCC - Power Supply Input
- GND - Power Supply Ground
- OUT - Active High Output

Components Description

- IR SENSOR An infrared sensor(IR) is an electronic device that measures and detects infrared radiation in surrounding environment.
- ARDUINO is open source electronic platform based on easy to use hardware and software and are able to read on a sensor, a finger on a button, and turn into an output activating a motor , turning on a LED, publishing something online.
- LED is a semiconductor device that emits light when current flows through it.
- PCB Printed Circuit Board mechanically supports and electrically connects electrical or electronic components using conductive tracks and pads.

SCOPE

The Future scope includes Profiling of the traffic by storing the data and managing the traffic lights according to the collected data. The Profiling can also be used for Traffic study and the variation in traffic density throughout the day, week, month or a year. Further, we can optimize this system for the emergency Vehicles such as Ambulance. The Traffic data collected can be used to locate different routes for a specific daily vehicle to avoid the congestion problem

CONCLUSION

By using this system configuration we can reduce the possibilities of traffic jams caused by traffic lights to an extent. The number of passing vehicles on the road decides the density range of traffics and on the basis of vehicle count microcontroller decides the traffic light delays.
Thus from above theory we can conclude that using this method of density based control of traffic lights we can save a considerable amount of time and also we can prevent excessive traffic jams thus leading to smooth traffic flow. In practice presently in India we are following time based control of traffic signals and we are experiencing a heavy traffic jams all over which in turn consumes lot of time and fuel. We hope these methods will be adopted as soon as possible so that the limitations we are experiencing with present method can be overcome.

Thank you