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DENSITY BASED TRAFFIC LIGHT SYSTEM

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***Abstract*— The project has been designed to develop a dynamic road signal based on density. The sync signal automatically switches to detecting traffic density at the intersection. Traffic congestion is a serious problem in many large cities around the world and has become a nightmare for travelers in these cities.**

The conventional traffic light system is based on the concept of fixed time assigned to each side of the joint that can not be varied by varying traffic density. The tie times assigned are fixed. Sometimes a higher traffic density on one side of the joint requires a longer time than the standard green time allocated.

The project featured with an Arduino Uno with interface sensors automatically switches the synchronization of the union to accommodate the movement of the vehicles gently avoiding unnecessary waiting times at the intersection.

The sensors used in this project are infrared proximity sensors in the sight line configuration through the loads to detect the traffic light density. The vehicle density is measured in a number of sectors based on the times assigned as a result.

In addition, the project can be improved by synchronizing all traffic nodes in the city by creating a network between them. The network can be wired or wireless. This synchronization will greatly reduce traffic congestion.

I. INTRODUCTION

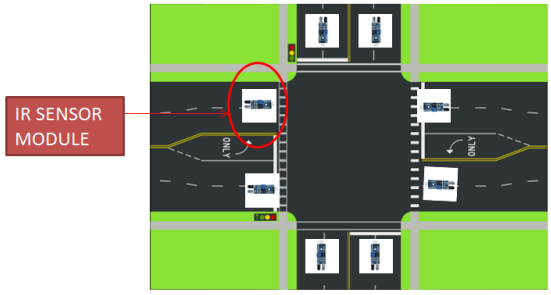
In the current scenario the problem is increasing and congestion of vehicular traffic is a serious problem in many modern cities all over the world. To overcome the problem, we have created a unique idea for one dynamic light and expert automatic control combined with a simulation mode. Traffic Search aims to optimize the flow of traffic, as the roads are overloaded. Number of vehicles and resources are limited. However, there are still some limitations in existing traffic control. There are several models that provide solutions.

In our research we focused on the semaphore optimization controller in a city using wireless sensor. Traffic signal optimization is a big problem. Even for simple attachment optimal solution.

The problem becomes even more complex with multiple connections, as a light state is responsible for traffic flow only on this road. Another complication is that the traffic density fluctuates frequently depending on the time of the day, the day of the week and the time of the year

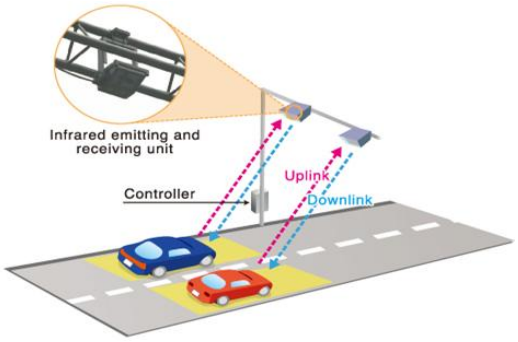
II. IMPLEMENTATION

This project is implemented by placing IR transmitters , receivers ,microcontrollers and leds at a 4 way junction as shown in Fig(i).



Fig(i)

The IR sensor monitors the traffic density at the four lanes of the intersection as shown in Fig(ii).



Fig(ii)

If the traffic at one of the lanes goes high the voltage output of the ir sensor goes low.The microcontroller reads the voltage output of the ir sensor and sets the corresponding delay time for the traffic signal at that lane.

We have categorized the traffic into five categories as Fig(iii). The microcontroller identifies the category of traffic density and assigns the corresponding time delay.

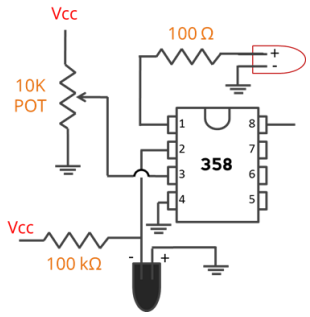
Traffic density	Time delay
Low Density	10sec(normal operation)
Medium Density	20 sec
High Density	30 sec
Very High Density	40 sec
Super High Density	50 sec

Fig(iii)

III. Components Used

A. Infrared Sensors

IR transmitter IR emits IR radiation (infrared). This is received by the photodiode, which acts as an IR receiver at the receiving end. Because IR radiation is invisible to the human eye it is perfect for wireless communication. A common modulation scheme for IR communication is 38kHz modulation. There are few natural sources that emit a 38kHz signal, so an IR transmitter that sends data at that frequency would stand out between the IR environment. Modular data 38kHz IR are the most common, but other frequencies can be used.
An IR sensor is shown inFig(iv).



Fig(iv)
The advantages of using IR sensor are

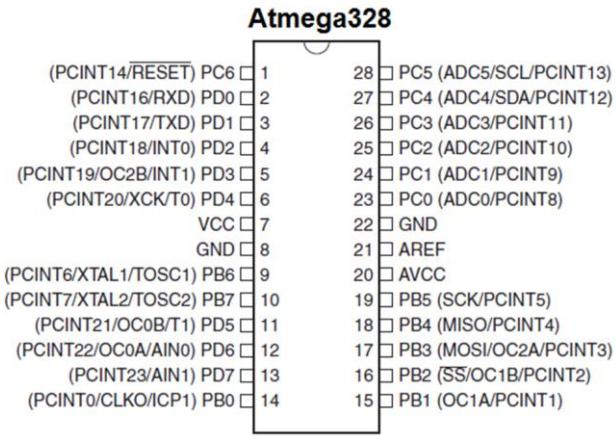
- Infrared sensors can detect infrared light from large distances over a wide area
- No interference with electrical devices
- Infrared technology is simple and extremely cheap
- The shield is simple
- No licenses are required

B. Arduino uno

Arduino / An authentic is an edge of the ATmega328P based microcontroller (technical card). It has 14 pin digital input / output (6 of which can be used as PWM outputs), 6 analog inputs, 16 MHz quartz crystal, USB connection, power connector, ICSP and a reset button. It contains everything you need to support the microcontroller; Just connect it to a computer with a USB cable or an AC-DC adapter or a battery to get started. You can play with one without worring too much to do something wrong, at worst it can replace the chip for a few dollars And restart.
"One" means one in Italian and was chosen to celebrate the launch of Arduino Software (IDE) 1.0. A plate and version 1.0 of Arduino software (IDE) were the Arduino reference versions, now evolved to newer versions. A plate is the first of a series of Arduino USB plates, and the reference model for the Arduino platform.

ATmega328 is a very popular microcontroller chip produced by Atmel. It is an 8-bit microcontroller with 32K Flash Memory, EEPROM 1K and 2K Internal SRAM.
The Atmega328 is one of the microcontroller chips used with popular Arduino Duemilanove cards. Arduino Duemilanove comes with any 1 to 2 microcontroller chips, or Atmega168 Atmega328. Of these 2, the Atmega328 chip is improved, more advanced. Unlike Atmega168 having 16K program memory and 512 bytes of SRAM internal flash, the Atmega328 has 32K program memory and 2K internal flash SRAM.
ATmega328 has 28 on the map.
It has 14 pin digital / S, 6 of which can be used while PWM and six analog input pins. These I / O 20 pins are on the map.

The pin Structure of Atmega328 is shown in fig(v).



Fig(v)

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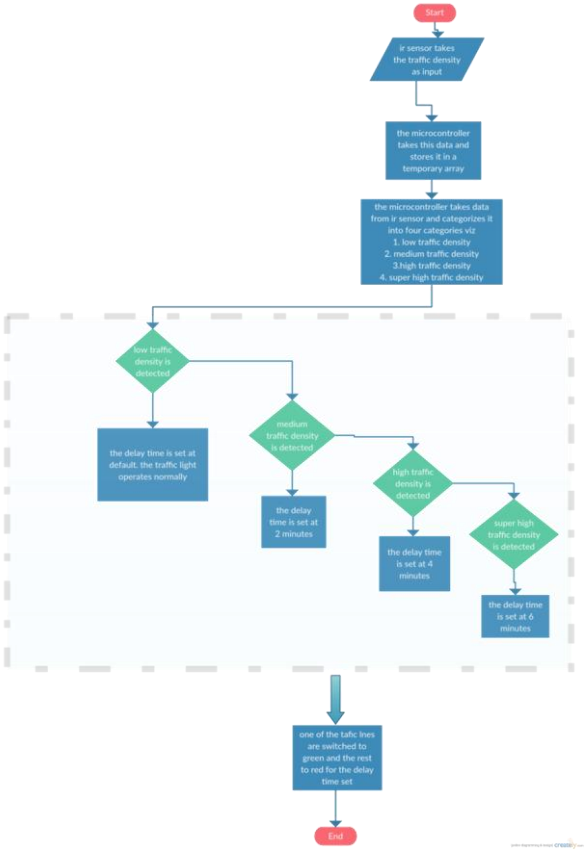
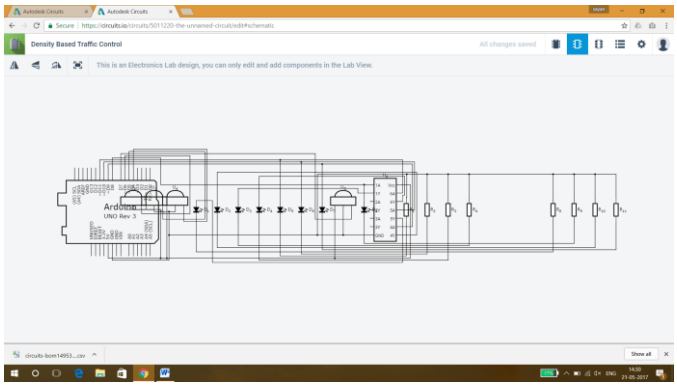
IV. WORKING



Fig(vi)
Flowchart depicting the entire working Process

V. CIRCUIT DIAGRAM

The circuit diagram is shown in Fig(vii).



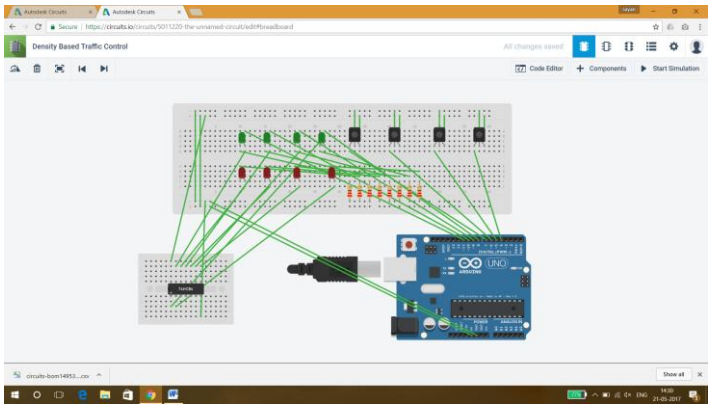
Fig(vii)

VI. SIMULATION

For this project we have used Autodesk® Circuits which is a free online circuit simulator.

- Advantages of using this simulator are
- Interactive real-time simulation
- Mixed analog-digital simulation
- Cycle-accurate microcontroller simulation
- Code debugger

Screenshots from the simulation is shown in Fig(viii)



Fig(viii)

VII. ADVANTAGES AND DISADVANTAGES

A. *Advantages*

For faster traffic transfer at crossroads

- Reducing travel times
- Greater efficiency
- Fuel saving
- Save people time
- Reduction of injuries.

B. *Disadvantages*

- Sometimes IR sensors can also absorb normal light. As a result, the traffic system works incorrectly.
- Infrared sensors work only for lower distances
- We need to accurately fix IR sensors, otherwise they will not be able to detect traffic density.
- If the image processing is performed, the output would be more accurate but would become more complex
- The infrared sensor may output erroneously, dust particles are recorded at a receiver signal transmitter

VIII. FUTURE SCOPE OF THE PROJECT

This project can bring India's digital revolution

Building an intelligent traffic city with automatic transmission is possible because vehicles can communicate wirelessly with the traffic system and make decisions on their own, making the autopilot more a reality.

This project can replace the current traffic system and open more avenues for a world ready for the future.

IX. REFERENNCES

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