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Density Based Traffic Light Control

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Abstract : *The project is aimed at designing a density based dynamic traffic signal system where the timing of signal will change automatically on sensing the traffic density at any junction. Traffic congestion is a severe problem in most cities across the world and therefore it is time to shift more manual mode or fixed timer mode to an automated system with decision making capabilities. Present day traffic signalling system is fixed time based which may render inefficient if one lane is operational than the others. To optimize this problem, we have made a framework for an intelligent traffic control system. Sometimes higher traffic density at one side of the junction demands longer green time as compared to standard allotted time. We therefore propose here a mechanism in which the time period of green light and red light is assigned based on the density of the traffic present at that time. This is achieved by using IR (proximity Infrared sensors).*
Keywords - *Arduino, Density, IR Sensor, Signal Lights, Traffic.*

I. INTRODUCTION

In today's high-speed life, setback becomes a giant issue in our day to day activities. It brings down the productivity of individual and thereby the society as variant work hour is wasted at the signals. High volume of vehicles, the inadequate infrastructure and to boot the irrational distribution of the signalling system unit main reasons for these chaotic congestions. It indirectly else adds to the rise in pollution level as engines keep in most cases, associate degree oversize volume of natural resources in forms of gas and diesel is consumed with none fruitful outcome. Therefore, to eliminate these issues or a minimum of crop them to special level, newer schemes ought to be compelled to be enforced by conveyance in detector-based automation technique throughout this field of traffic signalling system.

Conventional stoplight system depends on mounted time conception assigned to each face of the junction that can't be varied as per varied traffic density. Junction timings assigned square measure mounted. generally higher traffic density at one aspect of the junction demands longer inexperienced time as compared to plain assigned time. The projected system employing a microcontroller of ATMEGA family punctually interfaced with sensors, changes the junction temporal arrangement mechanically to accommodate movement of vehicles swimmingly avoiding spare waiting time at the junction. The sensors employed in this project square measure IR junction rectifier and photodiodes square measure in line of sight configuration across the masses to sight the density at the traffic light. The density of the vehicles is measured in 3 zones i.e., low, medium, high supported that timings square measure assigned consequently. The project is intended to develop a density based mostly dynamic traffic light system. The signal temporal arrangement changes mechanically on sensing the traffic density at the junction. traffic jam could be a severe drawback in several major cities across the planet and it's become a nightmare for the commuters in these cities.

We have additionally given our item by coming up with the density-based traffic light system victimization Arduino Uno AT Mega 328P. For an equivalent initially, we've thought of four IR sensors, eight LED's, eight 220 ohms resistors and one Arduino Uno that acts because the microcontroller. Here he IR sensors square {measure} accustomed measure the traffic density i.e.; the quantity of vehicles is counted that square measure

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passing through every IR sensing element that is named as traffic density and therefore the four IR sensors square measure interfaced with the Arduino Uno.
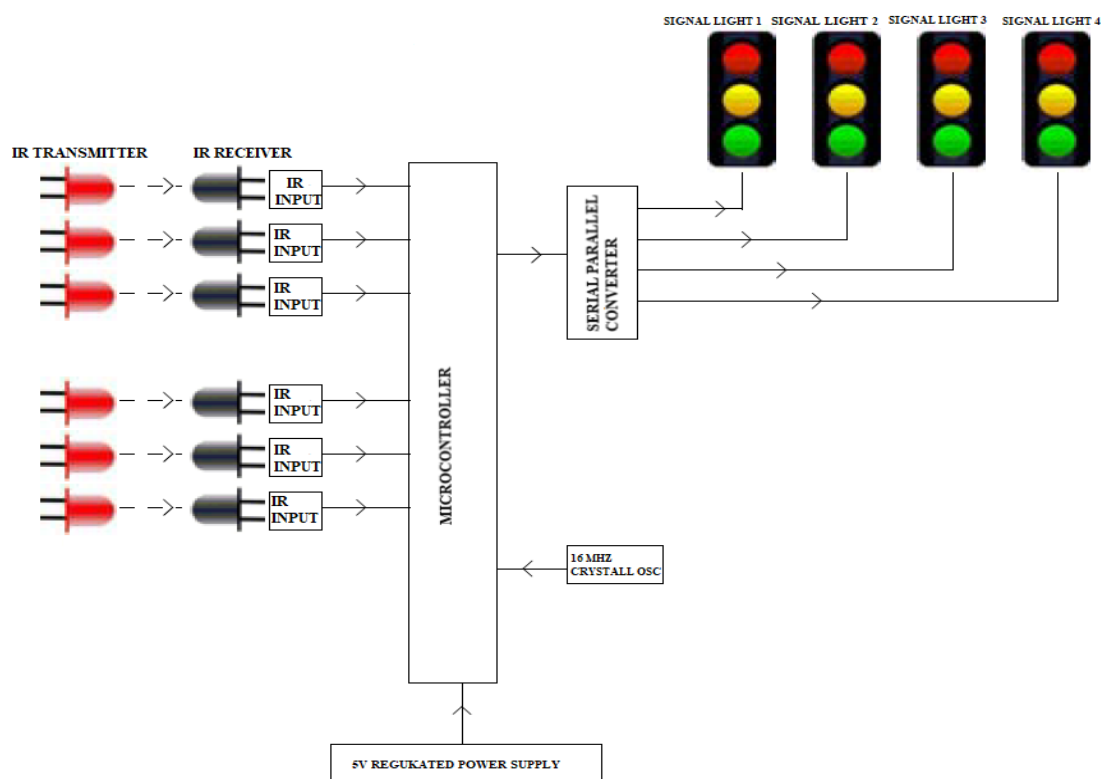
II.   METHODOLOGY

Fig No. 1: - Block diagram

The basic diagram of the density-based control system is as shown in Fig no.1, it consists of 4 roads, IR Sensors, quartz oscillator and signal lights (LED's). Density-based light management is an automatic means of dominant signals in accordance with the density of traffic within the roads. IR sensors are placed within the entire intersectant road at mounted distances from the signal placed within the junction. The time delay within the traffic light is about supported the density of vehicles on the roads. The IR sensors are accustomed sense the number of vehicles on the road. in line with the IR count, ATMEGA takes applicable selections on that road is to incline the best priority and therefore the longest time delay for the corresponding light.

The blocks in the Block Diagram are:

1. IR Sensor: - An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment.

2. Light emitting diode: - A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it.

3. Arduino ATMEGA 328: - ATMEGA-328 is basically an Advanced Virtual RISC (AVR) micro-controller. It supports the data up to eight (8) bits. ATMEGA-328 has 32KB internal built-in memory. This micro-controller has a lot of other characteristics.

4.crystal oscillator: - A crystal oscillator is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a constant frequency

5. Serial Parallel Converter: - The task of a serial to parallel converter is to take a stream of data in serial format and for N-bit parallel converter, give N-bits as parallel output.

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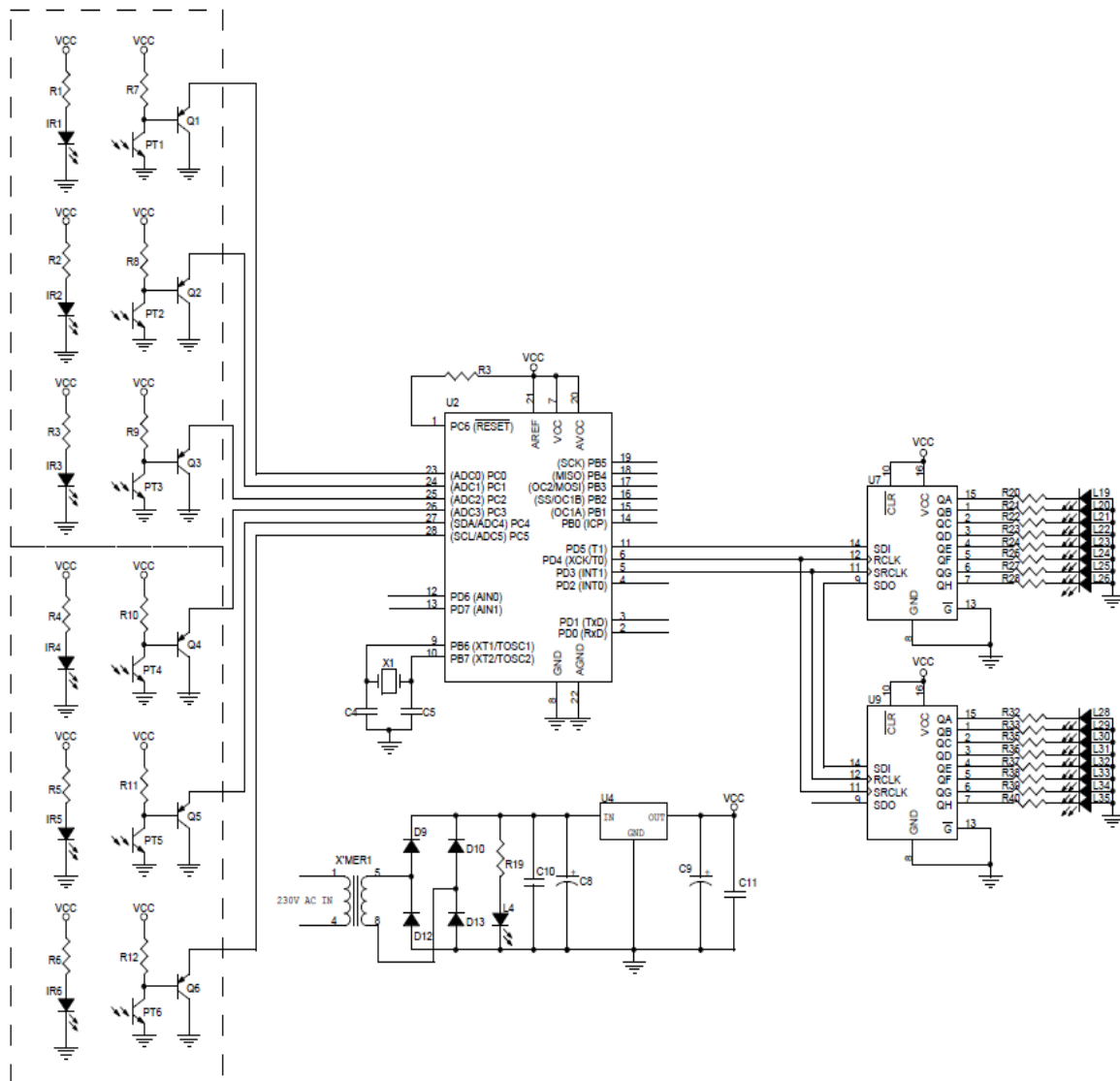
II. CIRCUIT DIAGRAM

Fig No. 2: - Circuit diagram

Changing delay of Traffic signals supported the number of vehicles passing through associate assigned section of the road, is that the working principle of the model. At four sides of four-way road four IR sensors unit placed, that counts the number of vehicles passing by the planet lined by the sensors. throughout this model we've an inclination to stand live exploitation IR sensors substitution system to vogue a density-based stoplight system. These IR transmitter and receiver square measure planning to be mounted on same sides of the road at a particular distance. The IR detector will observe the vehicle as a result of the vehicle passes through these IR sensors & will send the readings to the microcontroller.

The microcontroller counts the number of vehicles and provide the activate time to semiconductor to keep with the vehicle's density. Then the semiconductor may flip it on for higher time than average or the opposite approach around. The traffic lights unit initially running at a tough and quick delay of cardinal milliseconds, that in turn produces a delay of 1000+1 milliseconds at intervals the complete technique. Microcontroller is interfaced with semiconductor and IR sensors; this whole embedded system is placed at the junction.

IV. HARDWARE DESIGN

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The hardware style of this project is extremely easy and economical additionally. initial of all we've got designed the IR detector. The IR detector usually works as counter. And counter passes a symptom once a big variety of gesture or movement is detected. Then we've got designed the entire circuit within the bread board by the help of microcontroller. Arduino UNO plank is that the excellent option to build the project additional economical and easier additionally. during this system we've got used some basic parts to style this circuit. These parts area unit found simply at any physics retailers or markets. For numeration we've got created a lightweight detector with some basic parts. The output of this circuit is connected to the yellow, inexperienced and red lights of light. The system was designed to be easy, and also the experimental setup enclosed the example model of traffic lights showing lights from the four sides of a junction. The model enclosed traffic lights every on the four sides: representational process red, yellow and inexperienced colour. These area unit designed victimization-coloured bulbs of red, yellow and inexperienced colour.

The power provide circuit. It's supported three terminal voltage regulators, which offer the desired regulated +5V. Power is deliver at the start from commonplace 12V AC/DC adapter or 12V_500ma electrical device. this is often fed to bridge rectifier (D1 to D4) the output of that is then filtered victimization 1000uf condenser and fed to U2 (voltage regulator). U2 +5V output powers the small controller and alternative logic electronic equipment. diode L1 and its associate 1K current limiting resistors give power indication.

Fig No. 3: - Hardware design

V. COMPARISON TABLE

Table no. 1: - Comparison of Existing and Proposed System

SR. N0.	PARAMETER	EXISTING SYSTEM	PROPOSED SYSTEM
1	Time Require	More (Fixed Time Signals)	Less (Automatically on sensing the traffic density)
2	Signal Type	Fixed Time Signal	Traffic's actuated signals
3	Maintenance Cost	More	Less
4	Initial Cost	Less	More
5	Efficiency	Good	Better than existing system
6	Normal mode	Present	present
7	Normal and density mode	Not present	present
8	Resume capability	Not present	present
9	Labour	Required	Less than existing system
10	Flexibility	Less	more

VI. CONCLUSION

In this research we have worked on Congestion problem for such special areas which have dense traffic density. The system works on traffic related problems such as traffic jam; un reasonable latency time of stoppage of vehicle, emergency vehicles or forcibly passing, etc. can be solved. By using this system configuration, we try to reduce the possibilities of traffic jams, caused by traffic lights. Number of passing vehicle in the fixed time slot on the road decide the density range of traffics and on the basis of vehicle density calculation, microcontroller decide the traffic light delays. Succeeding leap forward is to implement this scheme in real world situation for initial hand results, before implementing it on the most important scale. With field application of this technology, the infuriating chaos of traffic are often effectively channelized by distributing the time slots supported. The advantage of the vehicle load in bound lanes of multi junction crossing.

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