DENSITY BASED TRAFFIC LIGHT CONTROL USING ARDUINO AND IR SENSORS WITH SPIKE AND EMERGENCY PROTECTION

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***Abstract*-Traffic congestion is one of the major problems in india.In our daily life we are spending too many times under the traffic signal. It is create a unnecessary things in peoples day to day life.Sometimes traffic signals are don't properly check the road and the signals are working with some time constrains.To reduce these problems, we are implement the automatic density based traffic light control using ARDUINO and IR sensors with spike protection.ARDUINO is one of the microcontrollers which is used to check the traffic lanes and activate the traffic signals.IR sensors which are placed in the side of the roads are sense the density of vehicles and send the data to the signals then Arduino will make decisions on the signals.from that we will reduce the waiting time in the signals.Bluetooth Module is used for allowing the emergency vehicles in the first priority by using the mobile application controlled by the ambulance driver.The spike protection will automatically enable when the traffic lights are goes into the red signal. It helps to unwanted traffic congestion.**

***Keywords:*-Arduino mega,IR sensors,Bluetooth module,Spike protection**

I.INTRODUCTION

In today's high speed life, traffic congestion becomes a significant issue in our day to day activities. It brings down the productivity of individual and thereby the society as voluminous work hour is wasted inside the signals. High volume of vehicles, the inadequate infrastructure and so the irrational distribution of the signalling system unit main reasons for this congestions. we have together presented our idea by designing the density-based traffic light control using Arduino mega 2560,IR.

Sensors for traffic light control and emergency , RF transmitter and receiver for automobile detection and servo motor for spike protection. Our project aims reducing traffic congestion and unwanted terribly while waiting in the signals. it's designed to be enforced in places nearing the junctions wherever the traffic signals area unit placed, so as to scale back the congestion in these junctions.It keeps a track of the vehicles in every road and consequently adjusts the time for every light signals.

In our country, Many peoples are using roadway transportation. In morning and evening time every office workers, students and peoples are stuck in heavy traffic and they have lots of stress during the traffic. From our project, we reduce the traffic congestion ,save time and reduce the stress level.

Now we are living in advanced scientific world and we are having lots of work and need more times to do that works.By wasting time in traffic signals we are unable to finish our works on time.definitely our project will be very helpful for those peoples who are have many works in their daily life.

Here we are using the Arduino mega for the overall control system .From that we can make many development in this project.By proceeding the arduino program ,we make different operations in our project.

When IR sensors senses the vehicles density on the each lane then calculate and compare the density of the lanes.At the end of this process, The automatic traffic light signal can automatically works on the heavy traffic lane.

Fig.1. Traffic Congestion

Our project aims at reducing tie up and unwanted very long time delay during the traffic signal switch overs particularly once the traffic is extremely low.

It is designed to be enforced in places nearing the junctions wherever the traffic signals area unit placed, so as to cut back the congestion in these junctions.It keeps a track of the vehicles in every road and consequently adjusts the time for each traffic signals.The higher the amount of vehicles on the road the longer are going to be the time delay allotted for that corresponding traffic signal.

II.DESIGN SPECIFICATION

A. ARDUINO

The Arduino MEGA 2560 is an open-source microcontroller board based on the Microchip ATmega328P microcontroller. The board is provided with sets of digital and analog input/output (I/O) pins which will be interfaced to varied enlargement boards (shields) and alternative circuits. The board has 54 Digital pins, 16 Analog pins, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable It are often powered by a USB cable or by associate degree external nine potential unit battery, although it accepts voltages between five and twenty volts.

Arduino UNO is used for RF transmitter and receiver pair operations.UNO has 14 digital pins and 6 analog pins and programmable with IDE(Integrated Development Environment) via B type USB cable.

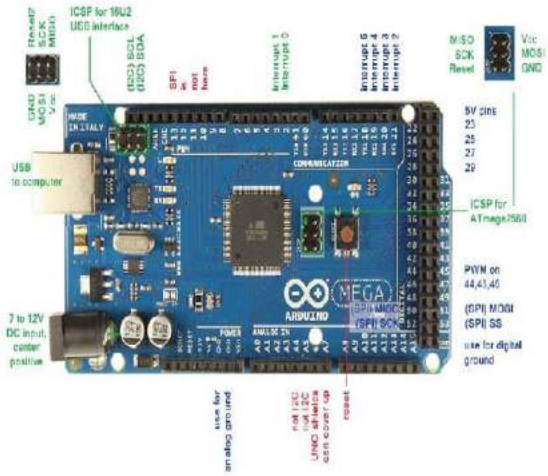

Fig.2. Arduino MEGA

B. IR SENSORS

Infra Red sensor is a electronic device,that emits the light from the sensor to sense the nearer object.It also measure the heat of an object as well as detect the motions. Usually, within the spectrum, all the objects radiate some sort of thermal radiation. These styles of radiations area unit invisible to our eyes, however infrared device will observe these radiations.IR sensors has light emitting diode,IR receiver or photodiode to sense the object and potentiometer to adjust the range of the photodiode.It has one output pin ,one vcc and one ground pin.

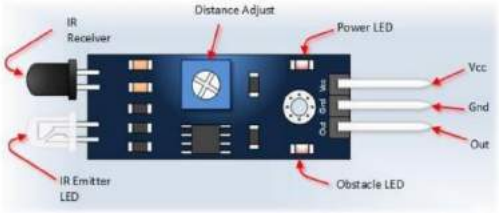

Fig.3. IR sensor

Pin Control Indicator	Description
Vcc	3.3 to 5 Vdc Supply Input
Gnd	Ground Input
Out	Output that goes low when object is in
Range Power LED	Illuminates when power is applied
Obstacle LED	lluminates when obstacle is detected
Adjust detection distance	Adjust detection distance
IR Emitter	Infrared emitter LED
IR Receiver	Infrared receiver that receives signal transmitted by Infrared emitter.

C. LED

Light Emitting Diode is a electronic device which is used for indication purpose.Here we are using threetypes of LED's .

Fig.4. LED

D. RESISTOR

A resistor is the two terminal electrical component that implements electrical resistances in the circuit.In electronic circuits,it resists the current flow.Here resistors are used as a protection for LED's.

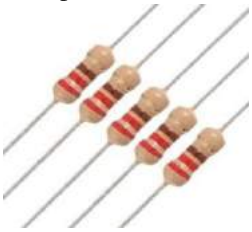

Fig.5. Resistors

E. BLUETOOTH MODULE

HC-05 Bluetooth Module is a simple to use Bluetooth SPP (Serial Port Protocol) module, designed for clear wireless serial association setup.HC-05 Bluetooth module provides switch mode between master and slave mode which implies it ready to use neither receiving nor transmission knowledge.

Fig. 6. Bluetooth Module

F. SERVO MOTOR

Servo motor is contolled by sending an electrical pulse of variable width, pulse width modulation (PWM) through the wire.It operates only turn 90° or either 180° angle. In our project servo motor is used to control the spikes.

Fig.7. Servomotor

II.PROPOSED METHODOLOGY

BLOCK DIAGRAM:

In this diagram, three IR sensors placed at each lane to calculate the density of the vehicles.Based on the IR sensors count the traffic signals will be control automatically.Arduino mega plays the major role in this project.It act as a main controlling unit for the total operations. Spikes are placed in each lane to stop the all vehicles during the traffic signal shows Red .When the green signal comes the spikes are go under the lane to allow the vehicles.

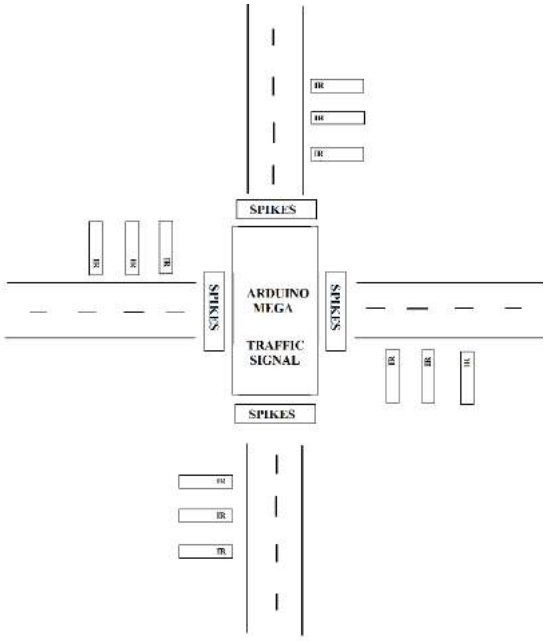

Fig.8. Block Diagram

CIRCUIT DIAGRAM:

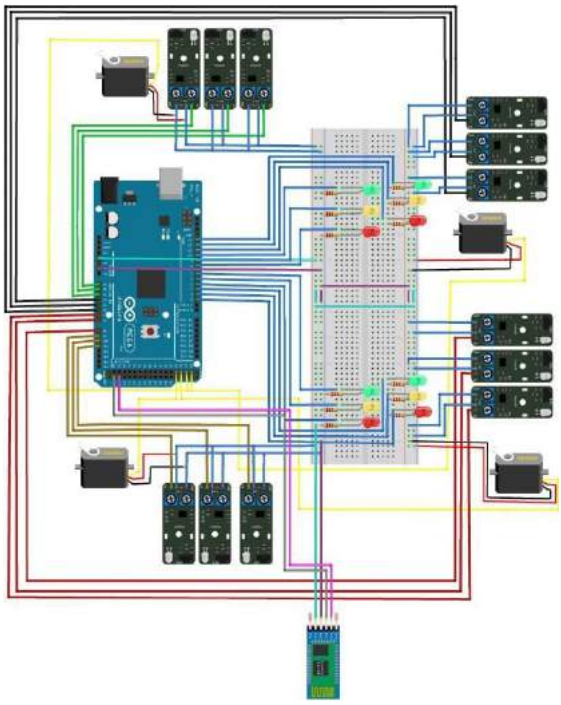

Fig.9. Ciruit Diagram of Traffic signal Control

Each lane has three IR sensors ,three LED's(red,yellow,green) and one servomotor.The first lane IR sensor output is connected in the analog pins A0,A1,A2 and the LED's are connected in digital pins 2,3,4 and servomotor output is connected in digital pin 22.The second lane IR sensor output is connected in the analog pins A3,A4,A5 and the LED's are connected in

digital pins 5,6,7 and servomotor output is connected in digital pin 24.The third lane IR sensor output is connected in the analog pins A6,A7.A8 and the LED's are connected in digital pins 8,9,10 and servomotor output is connected in digital pin 26.The fourth lane IR sensor output is connected in the analog pins A9,A10,A11 and the LED's are connected in digital pins 11,12,13 and servomotor output is connected in digital pin 28.

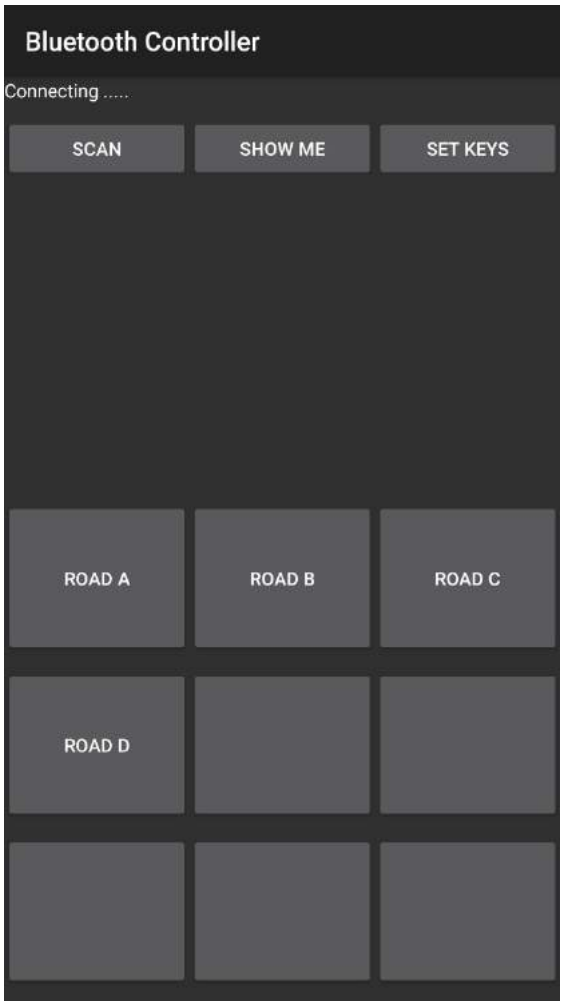

Fig.10. Application Interface

Bluetooth module is used for allowing emergency vehicles in first priority.Bluetooth module is placed in the traffic signal and that is control by using application interface shown in the figure the module is connected in the digital pin 49 and 50.

WORKING:

The model works on the principle of changing of Traffic signals based on the density through an assigned section of the road. There are three sensors placed at one side of each road which checks the density of the area covered by the sensors.

Here we are using IR sensors to sense the density of the vehicles on each road on the four way.IR sensors will detect the vehicles and send the data to Arduino.The output of the IR sensors are shows through the LED's in the traffic signal.Servo motors are placed at the each road end for protection purpose and it has spikes.The total no.of. IR sensors are required are 12, LED's 12 and servomotors 4.Three sets of LEDs via Green, Yellow and Red are used to indicate the GO state, Ready to Go state and WAIT state.

At initial stage,If there is same vehicles density on the each road the traffic signal shows the lights with some time constrains. The LEDs G (green), Y (yellow) and R (red) glow in following sequence.

- G1-R2-R3-R4
- Y1-Y2-R3-R4
- R1-G2-R3-R4
- R1-Y2-Y3-R4.
- R1-R2-G3-R4
- R1-R2-Y3-Y4
- R1-R2-R3-G4
- Y1-R2-R3-Y4

When condition changes as only the road 2 have high density than others.It shows the following sequnces.

- G1-R2-R3-R4
- Y1-Y2-R3-R4
- R1-G2-R3-R4

Similarly ,road 3 have high density it follows the below sequences.

- R1-G2-R3-R4
- R1-Y2-Y3-R4
- R1-R2-G3-R4

If there is two side of the roads have the same density of vehicles it follows the sequences.

- R1-R2-G3-R4
- R1-Y2-Y3-R4
- R1-G2-R3-R4
- R1-Y2-R3-Y4
- R1-R2-R3-G4

From above sequences, we can understand road 2 and 4 has the same density so the road 2 shows the green signal for some time then it will go for the road 4.If three roads have same density it will continue the sequences by the order which is given in the Arduino program.

For example road 1,3 and 4 have the same density ,the green signals shows in the order of 1,3 and 4.

- R1-G2-R3-R4
- Y1-Y2-R3-R4
- G1-R2-R3-R4
- Y1-R2-Y3-R4
- R1-R2-G3-R4
- R1-R2-Y3-Y4
- R1-R2-R3-G4

During the red light in any traffic light signal the spikes moves upward the road,the traffic light signal

control change into the green light the spikes moves downward from the road.The Bluetooth module is connected in traffic signal and it is controlled by ambulance driver by using application shown in the figure.10.The traffic will works normaly suppose the ambulance will come in the RoadA the driver will press the RoadA button in the application the RoadA lan will open it will automatically change the signal from red to green.

If there's traffic in any respect the signals, then the system can work usually by dominant the signals one by one. If there's no traffic close to a symbol, then the system can skip this signal and can move to subsequent one. for instance, if there's no vehicle at signal a pair of, three and presently the system is permitting vehicles at signal one to pass.

IV.RESULTS AND DISCUSSIONS:

The circuits once enforced one by one works as per the specified output but throughout integration all, output fluctuates and shows totally different response when. this might be a haul of loose connections of the wires or internal wiring of the bread board used. This project lists down the results complete from the sensible work and examines whether or not ideas / resolution approaches suggested in analysis area unit met by the sensible implementation. For this project the most communication is by victimization IR technology and RF transmitter and receiver technology with servo motor protection.

From the series of experiments we've got conducted the subsequent results were obtained:

•Traffic are often cleared with none irregularities

•Time are often shared equally for all intersections

•Effective time management

In the software view it add the IR sensor count and then make it into the descending order vise the traffic will be allowed it will shown in the figure.11.

In emergency vehicle allowing time the Bluetooth module will play a role in that it will works fine and faster.

Our main aim is allowing emergency vehicles in first priority and not breaking the rules and regulations of traffic control,so we are implemented the spike protection for puncture the vehicles those who are breaking the rules and Bluetooth module control is for emergency vehicles.

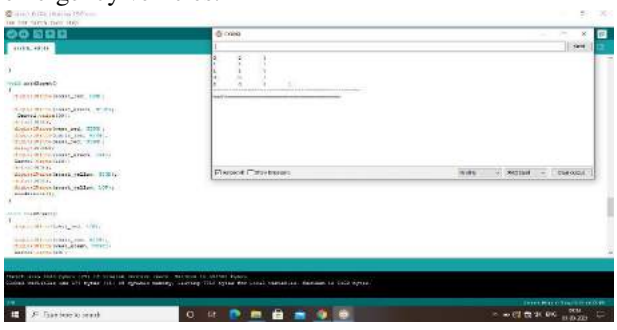

Fig.11. Output of The IR sensors Value

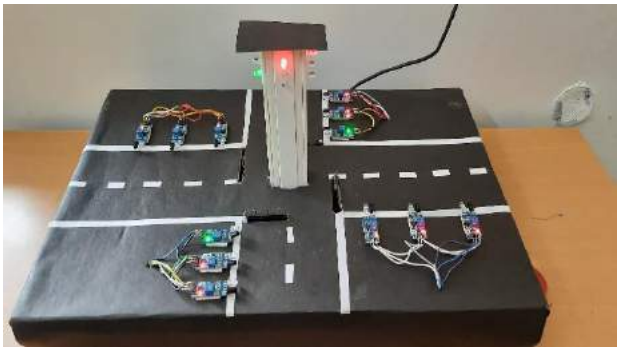

Fig.12. Output of The Project

V.CONCLUSION:

There is exigent want of economical traffic management system in our country, as India meets with 384 road accidents daily. to scale back this congestion and unwanted time delay in traffic a complicated system is intended here during this project. With field application of this technology, the displeasing chaos of traffic may be effectively channelized by distributing the time slots supported the advantage of the vehicle load in bound lanes of multi junction crossing. we've got with success enforced the model at laboratory scale with exceptional outcome. future discovery is to implement this schema is reality situation for initial hand results, before implementing it on the most important scale. we tend to believe that this might bring a revolutionary amendment in traffic management system on its application in actual field atmosphere.

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