SMART TRAFFIC CONTROLLING SYSTEM WITH AMBULANCE DETECTOR

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Abstract: - The project is aimed at designing a density based dynamic traffic signal system; the timing of the 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. 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 on the basis of the density of the traffic present at that time. This is achieved by using PIR (proximity Infrared sensors). Once the density is calculated, the glowing time of green light is assigned by the help of the microcontroller (Arduino). The sensors which are present on sides of the road will detect the presence of the vehicles and send the information to the microcontroller (Arduino) where it will decide how long a flank will be open or when to change over the signal lights. In this paper we provide the above information with a block diagram and flowchart.

Keywords: ARDUINO, PIR Sensors, Traffic controlling System, Ambulance detection

1. INTRODUCTION

Traffic management has become one of the severe problems today because of the growth of industrialization and population. There has been a tremendous growth in the traffic. With the increase in traffic there arise a number of problems such as heavy traffic jams, violation of traffic rules etc. Mismanagement and traffic congestion also results in long waiting times, loss of fuel and money etc. It is therefore necessary to have a fast, economical and efficient traffic control system for national development. One way to improve traffic flow and safety of the current transportation system is to apply automation and intelligent control methods to roadside infrastructure as well as vehicles.

The development of the smart traffic signaling system and using the arduino technology for deciding the amount time for each lane with the help of PIR sensors that can be effectively made to use by the traffic police and department. This decreases the work of human interaction in controlling the traffic and can maintain perfect control over peak time density of vehicles.

1.2 OBJECTIVE

The main objective of the paper is to propose a solution for the traffic congestion by using present technology and also giving importance to the Emergency vehicles(Ambulance) for their smooth uninterrupted travel in the heavy traffic.This is practically shown in test cases which are made by creating a real time traffic environment.

2. HARDWARE DESCRIPTION:
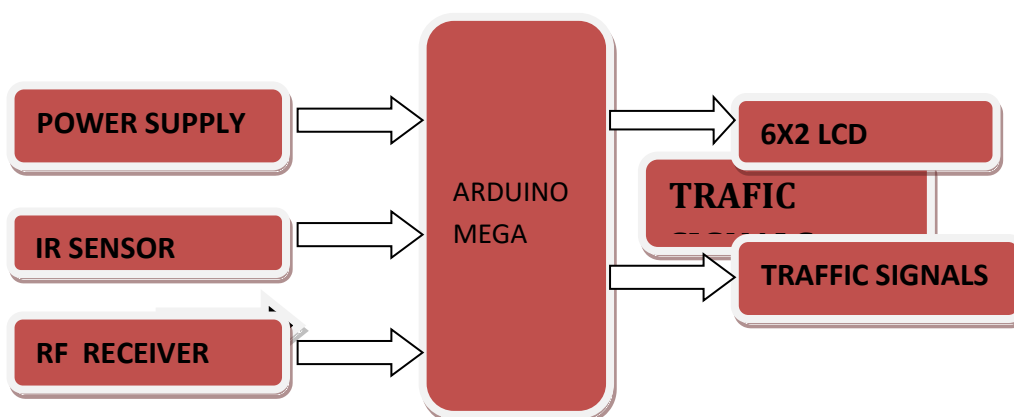
Figure 2.1: Block Diagram of Smart Traffic Controlling System with Ambulance Detection

The main part of the device is ARDUINO MEGA which is in the middle of all the other peripherals and controls the whole operation by taking inputs and giving outputs to Traffic Signals (LEDs) and LCD. The information gathering peripherals IR Sensors and RF receiver are connected to input ports and whole process is done by giving required power supply using transformers and rectifiers.
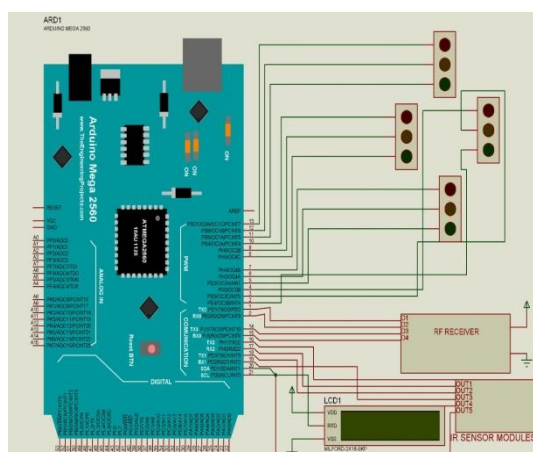
FIG 2.2: Circuit diagram of present model

2.1 Working of Arduino Traffic Light Controller

This project is done to give you an idea of how the traffic light controller works. This is not the real time traffic light controller. So at start, the green light of signal 1 and red lights at other signals will light up to give time to the vehicles at signal 1 to pass. After 10 seconds, the yellow light at signal 1 will light up to give an indication that the red light at signal 1 is about to come up and also to give an indication to the vehicles at signal 2 that the green light is about to light up. So after 5 seconds, red light at signal 1 will come up and green light at signal will come up meaning vehicles at signal 1 must stop and vehicles at signal 2 can move. Similarly the traffic light controller will work for the signal 3, signal 4 and the system will keep looping .If density of any particular lane increases IR sensors activate and gives signal to arduino which sets the time period for that lane for example ,In this project we have set 20 seconds timing for heavy density.

3 MAIN COMPONENTS

3.1 ARDUINO MEGA 2560:

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560 (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC to DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Dumilanove or Diecimila.

3.1.1 Specifications of present MICRO CONTROLLER :Table 1

Microcontroller	ATmega2560
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	54 (of which 14 provide PWM output)
Analog Input Pins	16
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	256 KB of which 8 KB used by boot loader
SRAM	8 KB
EEPROM	4 KB
Clock Speed	16 MHz

3.2 PRINCIPAL OPERATION OF IR SENSOR

IR LED emits infrared radiation. This radiation illuminates the surface in front of the LED. Surface reflects the infrared light. Depending on the reflectivity of the surface, the amount of light reflected varies. This reflected light is made on a reverse biased IR sensor. When photons are incident on the reverse biased junction of this diode, electron-hole pairs are generated, which results in reverse leakage current. Amount of electron-hole pairs generated depends on the intensity of incident IR radiation. More intense radiation results in more reverse leakage current. This current can be passed through a resistor so as to get proportional voltage. Thus as intensity of incident rays varies, voltage across the resistor will vary accordingly.

This voltage can then be given to an OPAMP based comparator. Output of the comparator can be read by us. Alternatively, you can use on-chip ADC in AVR microcontroller to measure this voltage and perform comparison in software.
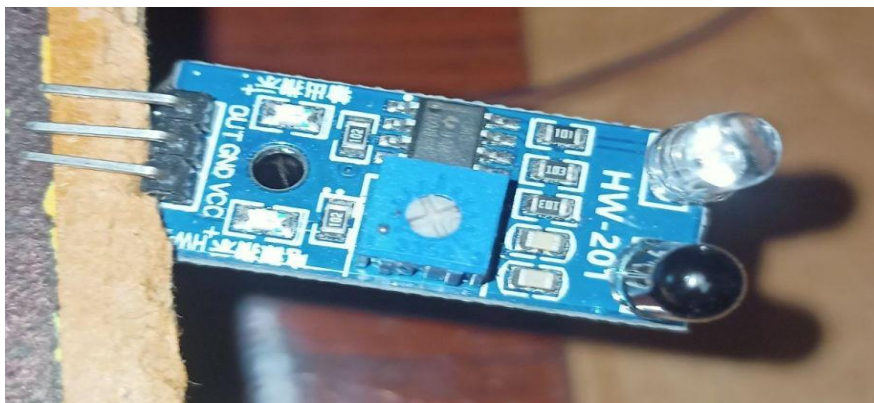
FIG: 3.1 IR Sensor

4. OBSERVATIONS AND RESULTS: Table 2

Sl. No.	OPERATIONS	TIME DURATION
1	Normal condition	Red : Always ON for other 3 lanes Green : 10 seconds for each lane Yellow : 5 seconds for each lane
2	High density at lane 1	Red : Always ON for other 3 lanes Green : 20 seconds ON at lane 1 Yellow: 5 seconds for each lane
3	High density at lane 2	Red : Always ON for other 3 lanes Green : 30 seconds ON at lane 2 Yellow: 5 seconds for each lane
4	Ambulance arrival in any one lane	Green light ON until Ambulance cross the signal

OUT PUTS:
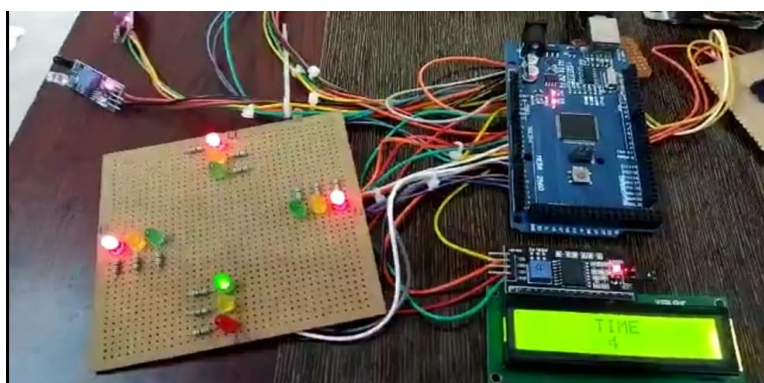
FIG 4.1: Green Signal for High traffic in Lane3
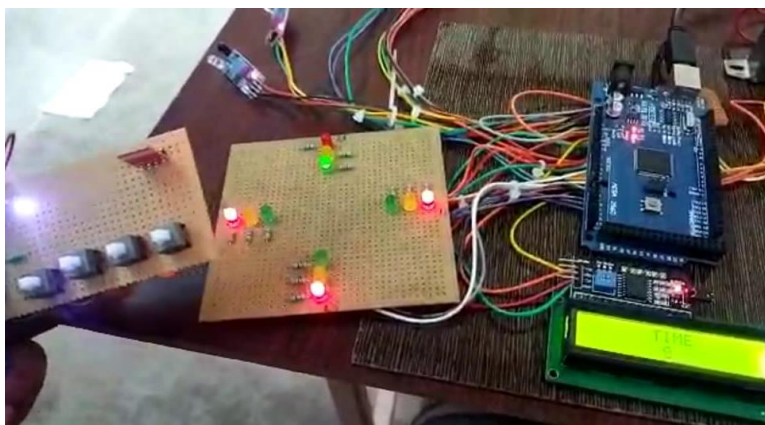
FIG 4.2: Ambulance detection Using RF device in Lane1

Advantages of Model:

1. Detecting congestion.

2. Synchronizing activity between traffic lights.

3. Updating traffic light timing in real time.

4. Updating and informing drivers of ideal speeds.

5. Prioritizing transportation flow.

6. Reduce congestion and time spent on the road

7. By reducing congestion it will decrease pollution

Disadvantages

● It will not work if there is no power supply.

● Sensitivity of the IR sensor will effected identification of density

● Once ambulance detection and giving priority to that lane is done the signal is not continuing to the next lane instead of this ,the signal is again appearing at first lane every time .This may cause some traffic issue.

CONCLUSION:

The project successfully works in removing traffic congestion problem by utilizing the SMART technology using ARDUINO and RF device and IR sensor.It provides adequate time for each lane in traffic and gives priority to the VIP vehicles like Ambulance for proper functioning of those vehicles in peak traffic times too.

FUTURE SCOPE:

Due to continuous growth of population in the world, it is a great challenge for the upcoming generation to manage the traffic system. Much improvement will come in the future. To manage the conventional transport system we should think of an intelligent and automatic way of controlling the system. By adding other features like artificial intelligence in future traffic control will be a small problem.

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