

# Traffic Signals based on Density with Innovative Clearance for Ambulance

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**Abstract:** This paper is designed to develop a traffic signal based on traffic density and also innovative control to clear the traffic for ambulance. During normal timings, the signal timing changes automatically by sensing the density at the junction. The movement of approaching an ambulance which is in emergency would have Android device that would override the set timing prompting instantaneous green signal in the desired direction, while blocking the other lanes by red signal for some time. This overriding set up can also be used for fire brigade, police vehicles; etc. Conventional traffic light system is based on fixed time concept allotted to each side of the junction which cannot be varied as per the varying traffic density. The proposed system uses an AT89S52 microcontroller (8051 family) interfaced with the sensors that change the junction timing automatically to accommodate the movement of vehicles smoothly to avoid unnecessary waiting time at the junction. IR sensors are used in this paper which is in line of sight configuration across the roads to detect density at the traffic signal. The density of vehicles is measured on which timings are allotted accordingly. Clearance to the emergency vehicle is activated by a Bluetooth operated by the Android device from the emergency vehicle. Furthermore, this paper can be enhanced by synchronizing all traffic junctions in the city by establishing a wired or wireless network among them. This synchronization will greatly help in reducing traffic congestion.

**Keywords:** AT89S52 microcontroller, Android, Bluetooth and IR Sensors

## I. INTRODUCTION

Traffic congestion is a severe problem in many modern cities around the world. Traffic congestion has been causing many critical problems and challenges in the major and most populated cities. To travel to different places within the city is becoming more difficult for the travelers in traffic. Due to these congestion problems, people lose time, miss opportunities, and get frustrated. Traffic congestion directly impacts the companies. Due to traffic congestions there is a loss in productivity from workers, trade opportunities are lost, delivery gets delayed, and thereby the costs goes on increasing.

To solve these congestion problems, we have to build new facilities & infrastructure but at the same time make it smart. The only disadvantage of making new roads on facilities is that it makes the surroundings more congested. So for that reason we need to change the system rather than making new infrastructure twice. Therefore many countries are working to manage their existing transportation systems to improve mobility, safety and traffic flows in order to reduce the demand of vehicle use.

The paper uses simple Electronic components such as LED as traffic light indicator and a microcontroller for auto change of signal after a pre-specified time interval based upon density.

Microcontroller AT89S52 is the brain of the project which initiates the traffic signal at a junction. The led's are automatically on and off by making the corresponding port pin of the micro controller high. At a particular instant only one green light holds and other lights hold at red. During transition from green to red, the present group yellow led and succeeding group yellow led glows and then succeeding group led changes to green. This process continues as a cycle. IR sensors are used in this paper which is in line of sight configuration across the roads to detect density at the traffic signal. The density of vehicles is measured on which timings are allotted accordingly. Clearance to the emergency vehicle is activated by a Bluetooth operated by the Android device from the emergency vehicle.

## II. BLOCK DIAGRAM

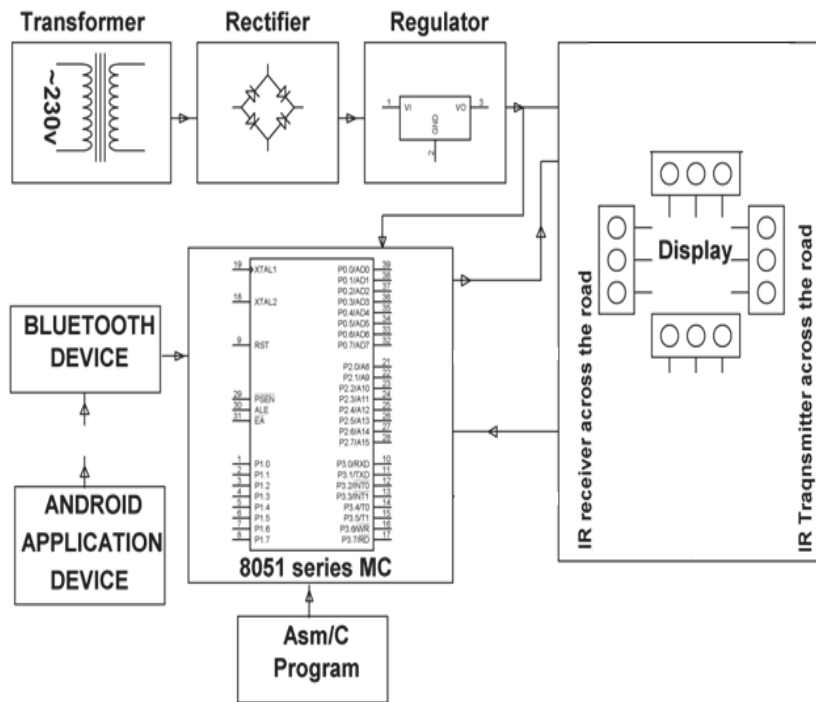


Fig. 1 Block diagram of traffic signal controller

### III. HARDWARE COMPONENTS

Sl. No.	Name of the components	Type
1.	Transformer	Step down 230/12 V, 50hz
2.	Bridge Rectifier	Diode(IN 4007)
3.	Filter	Capacitive(1000uF)
4.	Voltage Regulator	Zener (LM 7805)
5.	Microcontroller	AT89S52
6.	IR Sensor	LED + Photo Diode
7.	Blue tooth	HC05
8.	Android Device	Any

#### AT89S52 MICRO CONTROLLER:

Looking back into the history of microcomputers, one would at first come across the development of microprocessor i.e. the processing element, and later on the peripheral devices. The three basic elements-the CPU, I/O devices and memory-have developed in distinct directions. While the CPU has been the proprietary item, the memory devices fall into general-purpose category and the I/O devices may be grouped somewhere in-between.

The AT89S52 is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard MCS-51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcomputer, which provides a highly flexible and cost-effective solution to many embedded control applications.

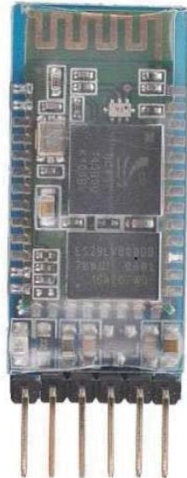


Fig.3.1 Bluetooth Device

The AT89S52 provides for 4k EPROM/ROM, 128 byte RAM and 32 I/O lines. It also includes a universal asynchronous receive-transmit (UART) device, two 16-bit timer/counters and elaborate interrupt logic. Lack of multiply and divide instructions which had been always felt in 8-bit microprocessors/micro controllers, has also been taken care of in the 89S52. Thus the 89S52 may be called nearly equivalent of the following devices on a single chip: 8085 + 8255 + 8251 + 8253 + 2764 + 6116.

In short, the AT89S52 has the following on-chip facilities:

- ROM (EPROM on 8751)
- 128 byte RAM
- UART
- 32 input-output port lines
- Two, 16-bit timer/counters
- Six interrupt sources and
- On-chip clock oscillator and power on reset circuitry

*Hardware details:*

The on chip oscillator of 89S52 can be used to generate system clock. Depending upon version of the device, crystals from 3.5 to 12 MHz may be used for this purpose. The system clock is internally divided by 6 and the resultant time period becomes one processor cycle. The instructions take mostly one or two processor cycles to execute, and very occasionally three processor cycles. The ALE (address latch enable) pulse rate is 16th of the system clock, except during access of internal program memory, and thus can be used for timing purposes.

PIN	ALTERNATE USE	SFR
P3.0 RXD	Serial data input	SBUF
P3.1 TXD	Serial data output	SBUF
P3.2 INTO	External interrupt 0	TCON-1
P3.3 INT1	External interrupt 1	TCON- 2
P3.4 TO	External timer 0 input	TMOD
P3.5 T1	External timer 1 input	TMOD
P3.6 WR	External memory write pulse	-----
P3.7 RD	External memory read pulse	----

Table 3.2 AT89S52 serial port pins

The two internal timers are wired to the system clock and pre scaling factor is decided by the software, apart from the count stored in the two bytes of the timer control registers. One of the counters, as mentioned earlier, is used for generation of baud rate clock for the UART. It would be of interest to know that the 8052 have a third timer, which is usually used for generation of baud rate.

The reset input is normally low and taking it high resets the micro controller, In the present hardware, a separate CMOS circuit has been used for generation of reset signal so that it could be used to drive external devices as well.

#### *BLUETOOTH HC05 :*

*Overview:* HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup.

Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband.

It uses CSR Blue core 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature).

It has the footprint as small as 12.7mmx27mm. Hope it will simplify your overall design/development cycle.

#### *Specifications :*

##### *Hardware Features :*

Typical -80dBm sensitivity.

- Up to +4dBm RF transmit power.
- Low Power 1.8V Operation, 3.3 to 5 V I/O.
- PIO control.
- UART interface with programmable baud rate.
- With integrated antenna.

- With edge connector.

#### *Software features*

- Slave default Baud rate: 9600, Data bits:8, Stop bit:1,Parity:No parity.
- PIO9 and PIO8 can be connected to red and blue led separately. When
- master and slave are paired, red and blue led blinks 1time/2s in interval,
- While disconnected only blue led blinks 2times/s.
- Auto-connect to the last device on power as default.
- Permit pairing device to connect as default.
- Auto-pairing **PINCODE:"1234"** as default.
- Auto-reconnect in 30 min when disconnected as a result of beyond the
- Range of connection.

#### IV. WORKING PRINCIPLE

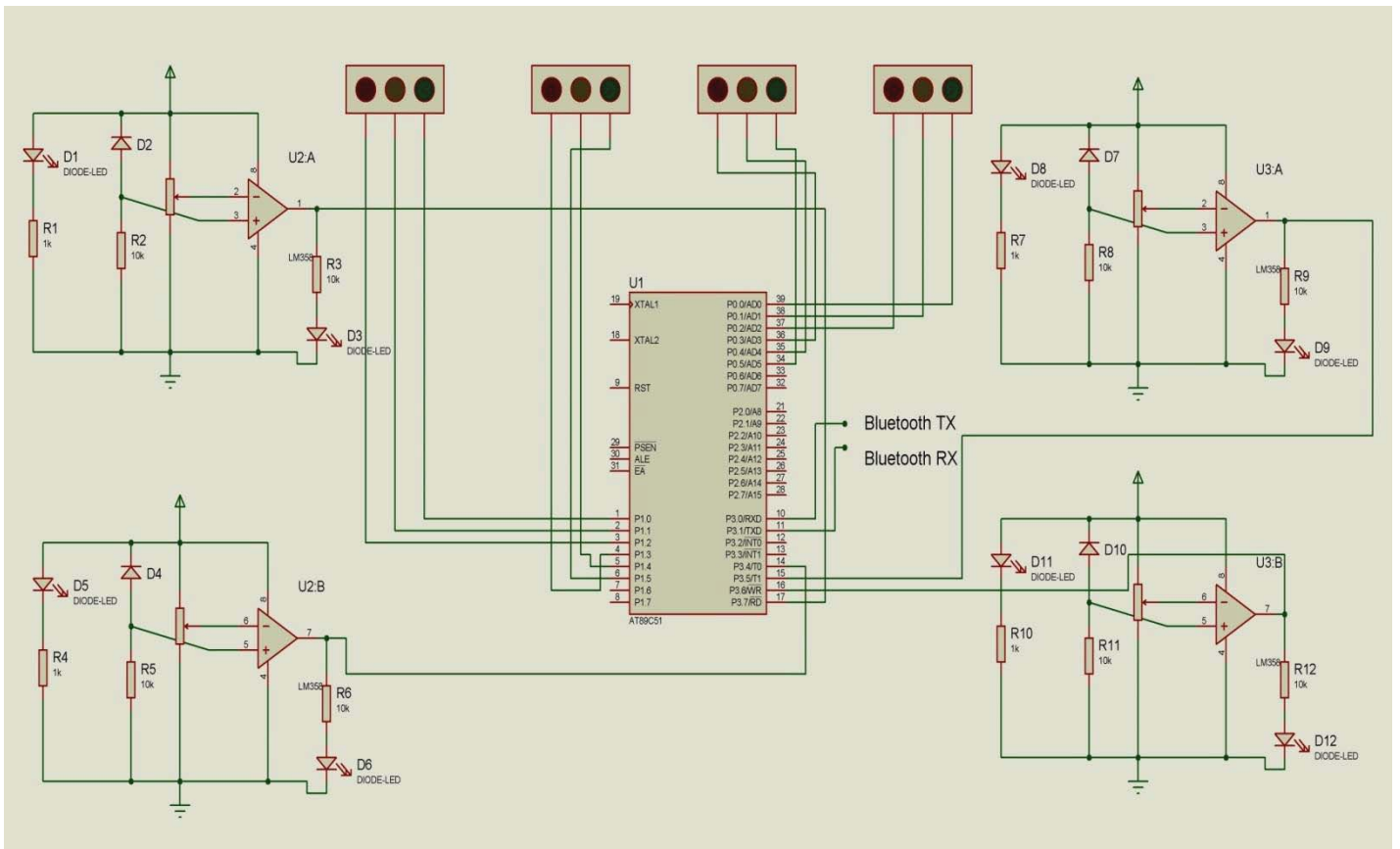
The paper uses the IR interruption concept for generating logic states to the input of the MC. To achieve the same a number of IR diodes are used facing photodiodes. While the IR light falls on the photodiode the resistance of the photodiode falls increasing the bias voltage. The voltage at the non inverting terminal will be greater than that of inverting terminal and the led connected to the comparator glows continuously.

Whenever there is an obstacle between the IR Led and Photodiode the resistance of the photodiode increases to a high value and the voltage at the non-inverting terminal will be less than that of inverting terminal and the output obtained is of negative logic. The Led connected to the comparator turns of indicating that there is a vehicle passing the road.

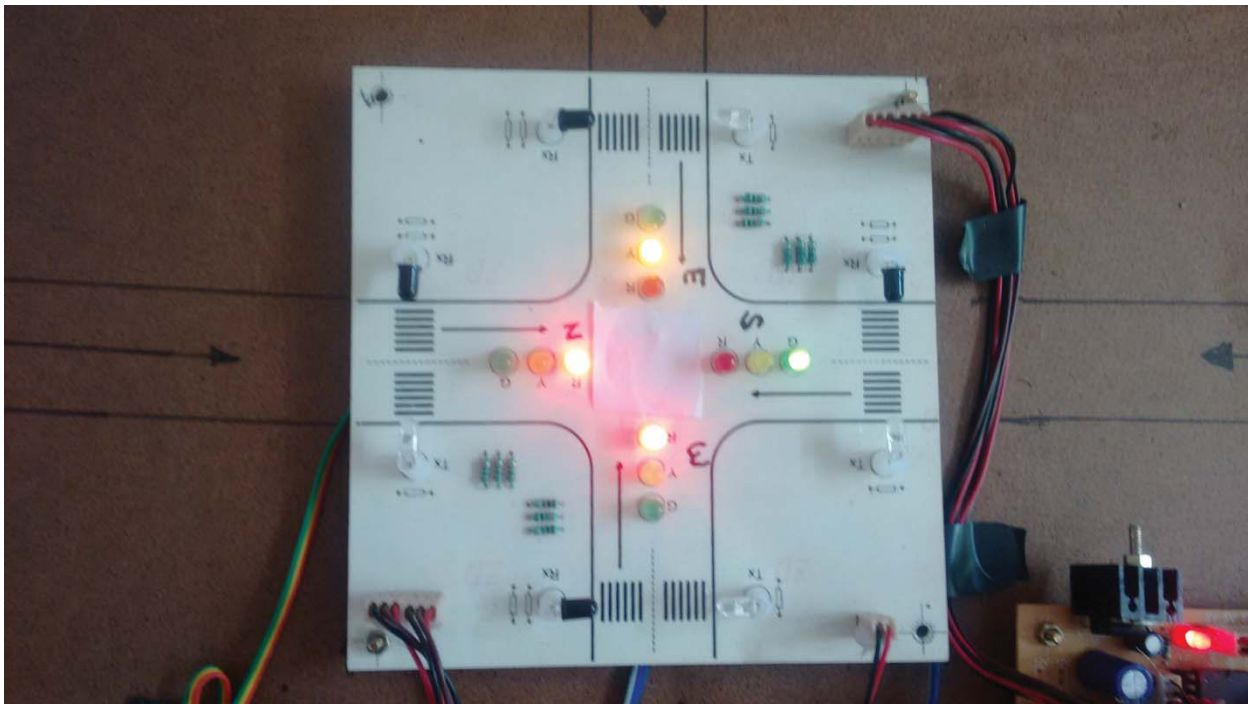
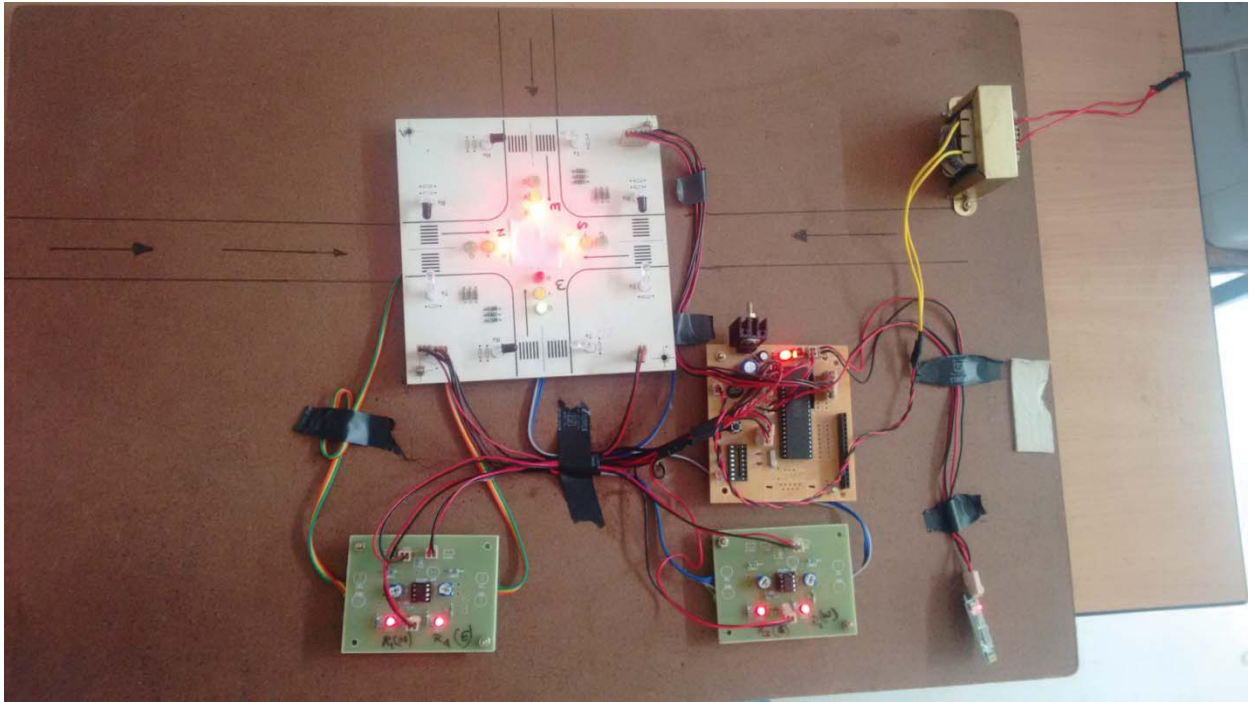
Depending on the number of vehicles passing the time required to turn the green signal also increases.

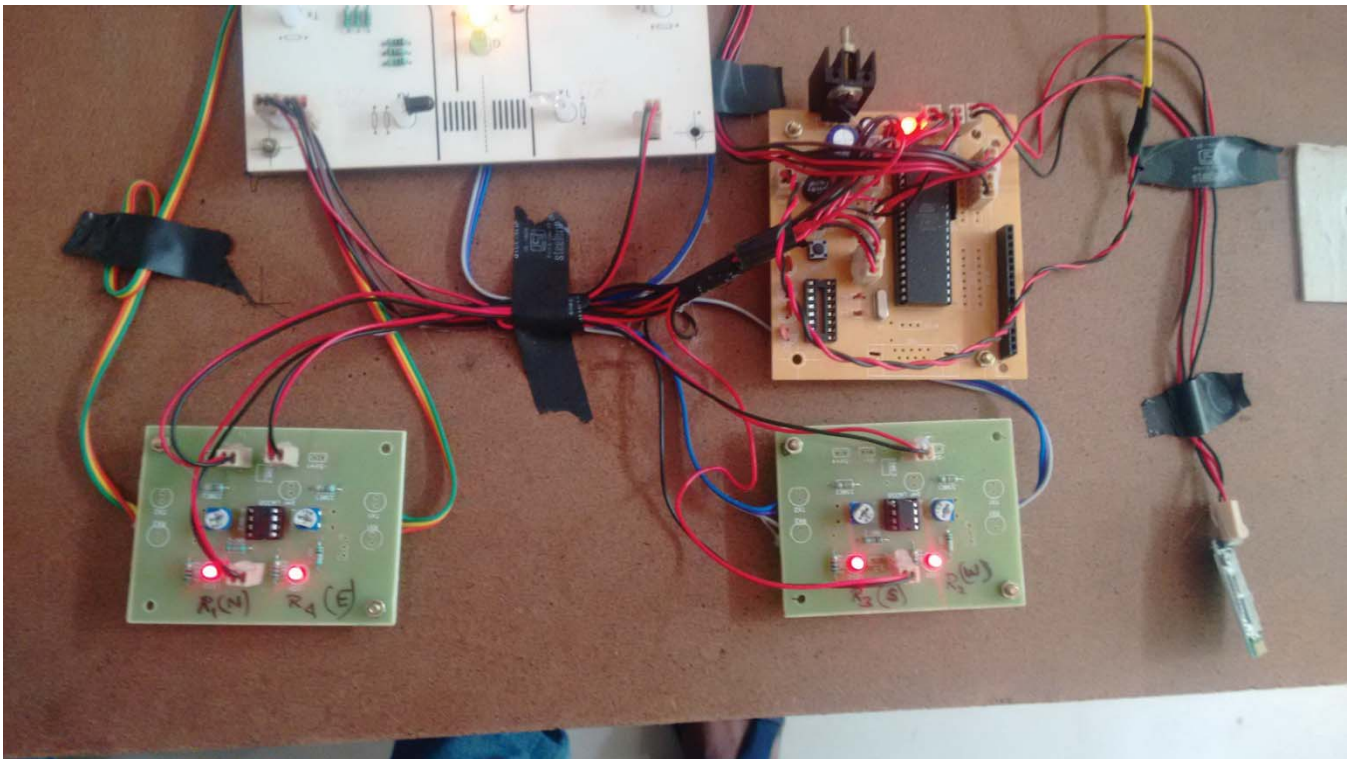
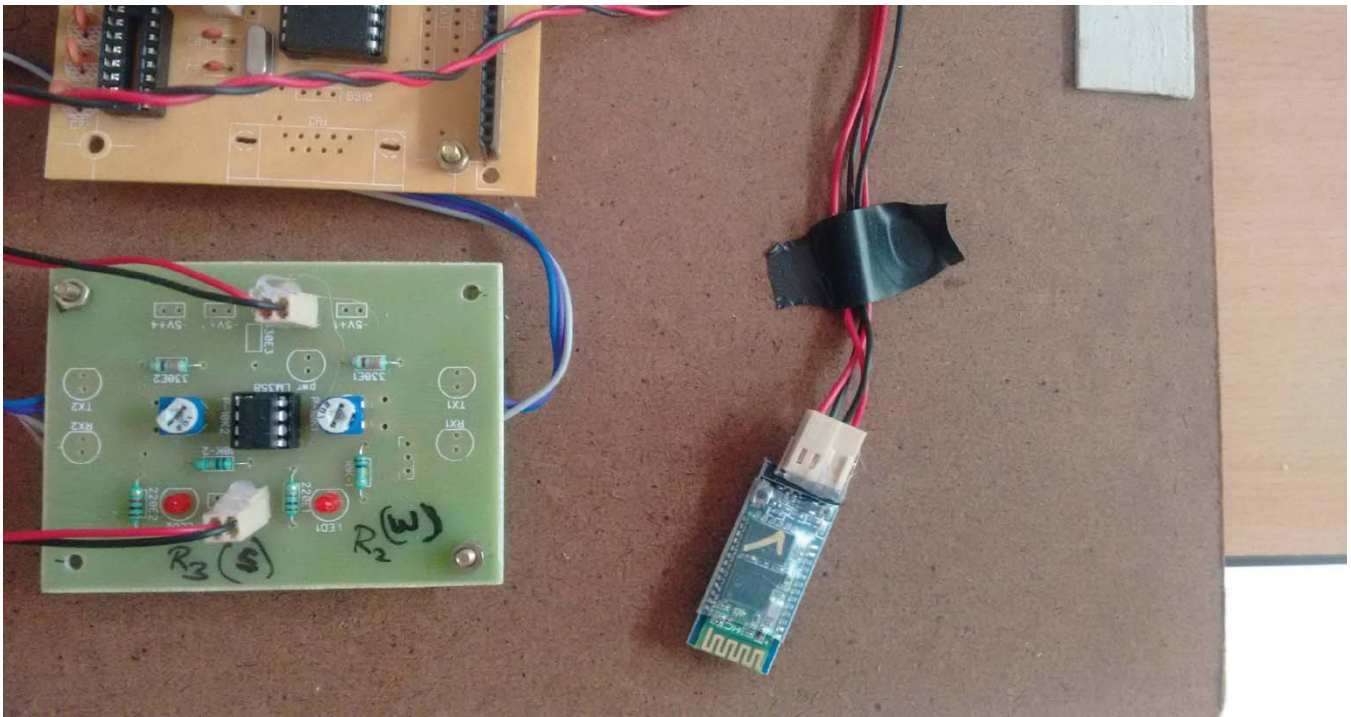
Whenever an emergency occurs a direct interrupt signal is send to the Bluetooth through the Android Device from emergency vehicle and these causes to clear the way to the emergency vehicle. Logic high sensed by the MC input changes the green ON time to a higher value for allowing more vehicles to pass through. After sometime in case any other way gets more logic high, the sequential timing gets automatically increased for that way.

Based on the IR interruption the green ON time increases, thus more the vehicle longer will be the green signal time. Thus dynamic time control is achieved based on the traffic density.



## V. HARDWARE KIT







## VI. CONCLUSION

The scope of the paper is to provide a clearance to the emergency vehicles and to decrease the occurrence of traffic jams.

### ADVANTAGES:

- Increases road safety.
- Improves traffic flow.
- Optimizes the traffic flow at network junctions.
- Gives the way when any emergency occurs.

### APPLICATIONS:

- Ambulances.
- Defense vehicles in emergency cases.
- Fire extinguishing vehicles.
- Police vans in emergency cases.

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