

# SMART TRAFFIC OPTIMIZATION

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**Abstract :** The main objective of this paper is to overcome the problem of traffic congestion so that its negative effects can be avoided. The Infrared sensor is used to detect the density of traffic on the road and it will indicate that traffic as heavy or normal traffic. The density of traffic identified by the IR sensor will be given as input to the microcontroller and that will be sent to the micro controller or web page through the GPRS module installed. We also develop the communication app for vehicle drivers to update live traffic condition in the destination path. For this communication app the input will come from traffic police each and every point of traffic signal. Those all inputs will integrate with GPS system and communication app will provide alternate route for user destination.

**IndexTerms** -Traffic congestion, Microcontroller, GPRS.

## 1.INTRODUCTION

The fact is that, the population of city and numbers of vehicles on the road are increasing day by day. With increasing urban population and hence the number of vehicles, need of controlling streets, highways and roads is major issue. The main reason behind today's traffic problem is the techniques that are used for traffic management. Today's traffic management system has no emphasis on live traffic scenario, which leads to inefficient traffic management systems. In normal mode all traffic lights runs in a sequence after a fixed time period like a real time traffic signal. When queue increases in any lane, IR sensor is blocked by the vehicles and that lane's signal turns to green until all traffic is cleared. Also rf readers are installed in all lanes to identify emergency vehicles. If vehicle with the rf tag enters a lane, It is identified and the lane's light turns green to clear all vehicles, making way for the emergency vehicle.

## 2. EXISTING SYSTEM

In present traffic system, the green signal will be in ON position whether that particular lane is of less vehicles or more number of vehicles. If in any particular lane ambulance is present then the lane should be waiting till that particular lane is turned green. Time congestion is occurred in that particular system. It takes two to three hours to clear the traffic if any obstacle (i.e., in case of any accidents or any long vehicle is blocking the road.

### 2.1. DISADVANTAGES OF EVM

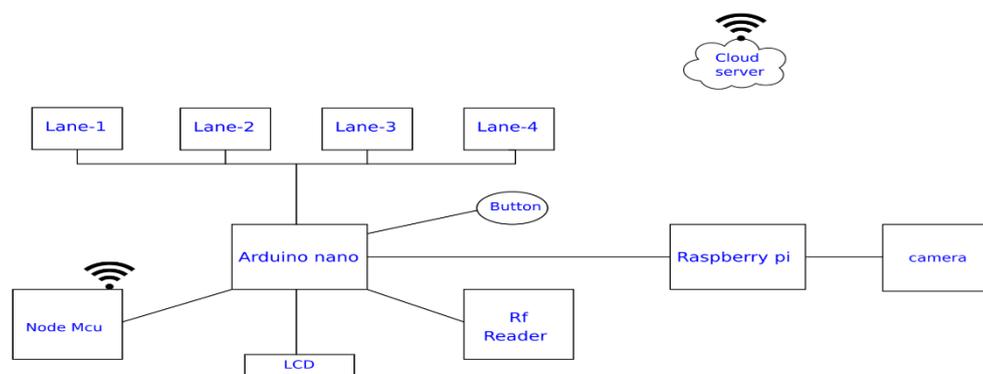
1. Time will be delayed.
2. There is no preference for any emergency vehicles.
3. Display messages will not be displayed in case of emergency.

## 3.PROPOSED SYSTEM

The following features are implemented in our proposed system

1. Priority based traffic clearance
2. Emergency vehicle detection using RFID
3. Safety message display on LCD
4. Display ALERT message on LCD

## 4. BLOCK DIAGRAM



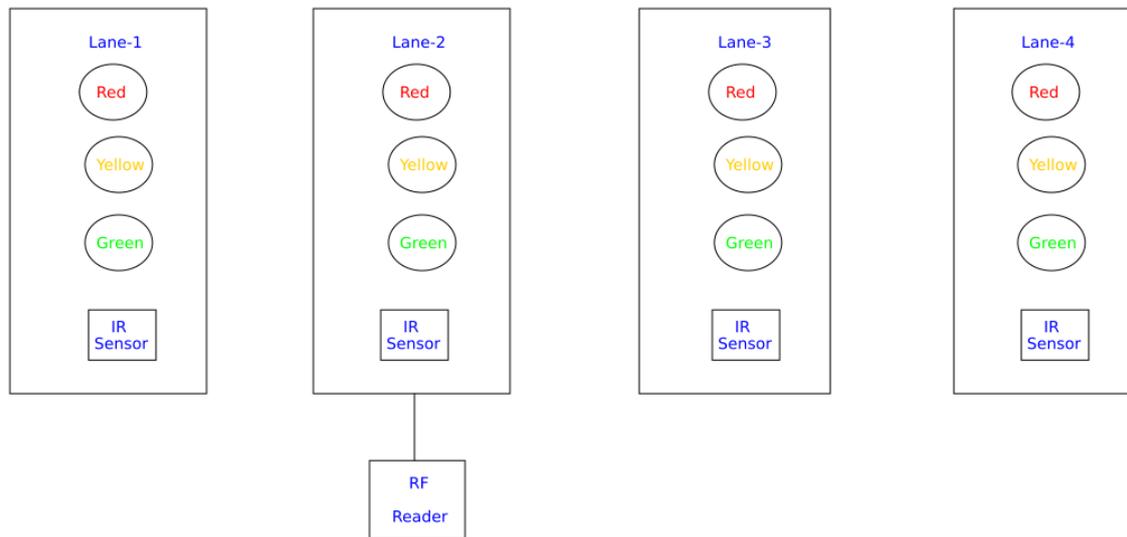


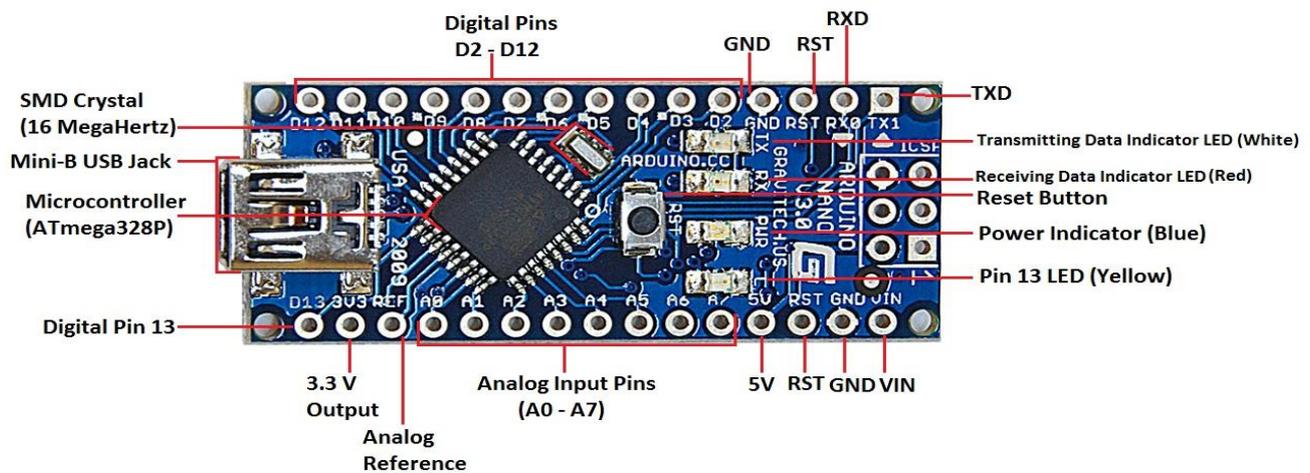
Fig.1 Block diagram of smart traffic optimization

## 5. HARDWARE COMPONENTS USED

In this prototype Arduino nano , Raspberry pi with camera, node McGPRS, rf tag, GSM module and 16x2 LCD display are used and described below:

### 5.1. Arduino Nano

Arduino Nano is a small board compatible with bread boards which is compatible with ATmega328. It has comparable usefulness to the Arduino Uno, however, when it comes to DIP module package, it works with a Mini-B USB link. This Arduino clone board is superbly compatible with Arduino IDE and cases. The operating voltage is 5V and the input voltage recommended is 7-12V. The digital I/O pins is 14 in which 6 provide PWM output. The clock speed is 16MHz.



## Arduino Nano V3.0 Pinout

www.CircuitsToday.com

Fig.2 Arduino Nano board

The pins in Arduino is described below

- **LED:** There is a built-in LED driven by digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.
- **VIN:** It is input power supply voltage to the board when using an external power source of 7 to 12 v.
- **5V:** It is a regulated power supply voltage of the board that is used to power the controller and other components placed on the board.
- **3V3:** This is a minimum voltage generated by the voltage regulation on the board
- **GND:** These are the ground pins on the board. There are multiple ground pins on the board that can be interfaced accordingly when more than one ground pin is required.
- **Reset:** Reset pin is added on the board that resets the board. It is very helpful when running program goes too complex and hangs up the board. LOW value to the reset pin will reset the controller.
- **External Interrupts:** pins 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.

- **PWM (Pulse Width Modulation):** 3, 5, 6, 9, 10, and 11 Can provide 8-bit PWM output with the analogWrite() function.
- **SPI (Serial Peripheral Interface):** 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.
- **TWI (Two Wire Interface) / I<sup>2</sup>C:** A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.
- **AREF (Analog Reference):** Reference voltage for the analog inputs.

### 5.2. Raspberry pi with pi camera

The Raspberry Pi 3 Model B+ is the latest product in the Raspberry Pi 3 range.

Broadcom BCM2837B0, Cortex-A53 (ARMv8) 64-bit SoC @ 1.4GHz. 1GB LPDDR2 SDRAM. 2.4GHz and 5GHz IEEE 802.11.b/g/n/ac wireless LAN, Bluetooth 4.2, BLE. Gigabit Ethernet over USB 2.0 (maximum throughput 300 Mbps). Extended 40-pin GPIO header. Full-size HDMI. 4 USB 2.0 ports. CSI camera port for connecting a Raspberry Pi camera. DSI display port for connecting a Raspberry Pi touchscreen display. 4-pole stereo output and composite video port. Micro SD port for loading your operating system and storing data. 5V/2.5A DC power input. Power-over-Ethernet (PoE) support (requires separate PoE HAT)



Fig Raspberry pi with camera

### 5.3. Node MCU

NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as luacjson and SPIFFS.



Fig Node MCU

### 5.2.LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. Command is the instruction which specifies the task and data is ASCII value of character to be displayed on the LCD

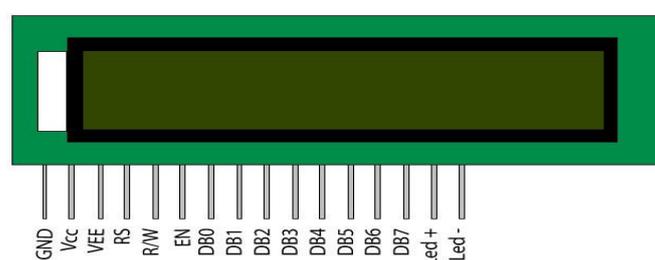


Fig.3 16x2 LCD Display

### 5.3. GPRS MODULE

The GPRS core network allows 2G, 3G and WCDMA mobile networks to transmit IP packets to external networks such as the Internet. The GPRS system is an integrated part of the GSM network switching subsystem.



Fig.6 GPRS Module

GPRS extends the GSM Packet circuit switched data capabilities and makes the following services possible:

- SMS messaging and broadcasting
- "Always on" internet access
- Multimedia messaging service (MMS)
- Push-to-talk over cellular (PoC)
- Instant messaging and presence—wireless village
- Internet applications for smart devices through wireless application protocol (WAP)
- Point-to-point (P2P) service: inter-networking with the Internet (IP)
- Point-to-multipoint (P2M) service<sup>[citation needed]</sup>: point-to-multipoint multicast and point-to-multipoint group calls.

### 6. SEQUENCE OF OPERATION

First in four lanes IR sensors are placed. If in any one lane the number of vehicles are crossed the lane which has crossed the threshold value then that particular lane displays green light. It processes for remaining lanes. If in any lane any emergency vehicle is there, first of all that emergency vehicle contains RFID tags. The emergency vehicle is detected by using rf reader and the lane which contains emergency vehicle is given preference so that the particular lane displays green signal. In this way we can reduce the number of accidents.

### 7. RESULTS

Firstly, the traffic signals are on as per the code. If any lane crosses the certain limit, IR sensor placed at this point senses and that particular lane is on green light. If in another lane emergency vehicle is passing then the lane which is having green turns to red and the lane where emergency vehicle is coming that particular lane changes green. Display message is also displayed on the LCD such as emergency give way. The RFID reader which is placed on the road reads by RFID tags which is placed to the vehicles so it reads and automatically the lane gives priority. Online traffic management is also available.

### 8. CONCLUSION AND FUTURE SCOPE

The proposed system result is as we expected. By this proposed system time management for signal lights is done which will reduce the traffic congestion problem. And the system has automatic and manual operation. When lost vehicle is identified an email will be dropped. Tracking of stolen automobile is done successfully and is fast. Clearance of traffic for emergency automobile is successfully implemented. Hence, many precious life would be saved. The architecture and functionalities of the proposed system are described along with supervised learning used to determine the attributes of traffic management. This advanced system, once implemented would drastically reduce traffic congestion in big cities and improve the security of vehicles.

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