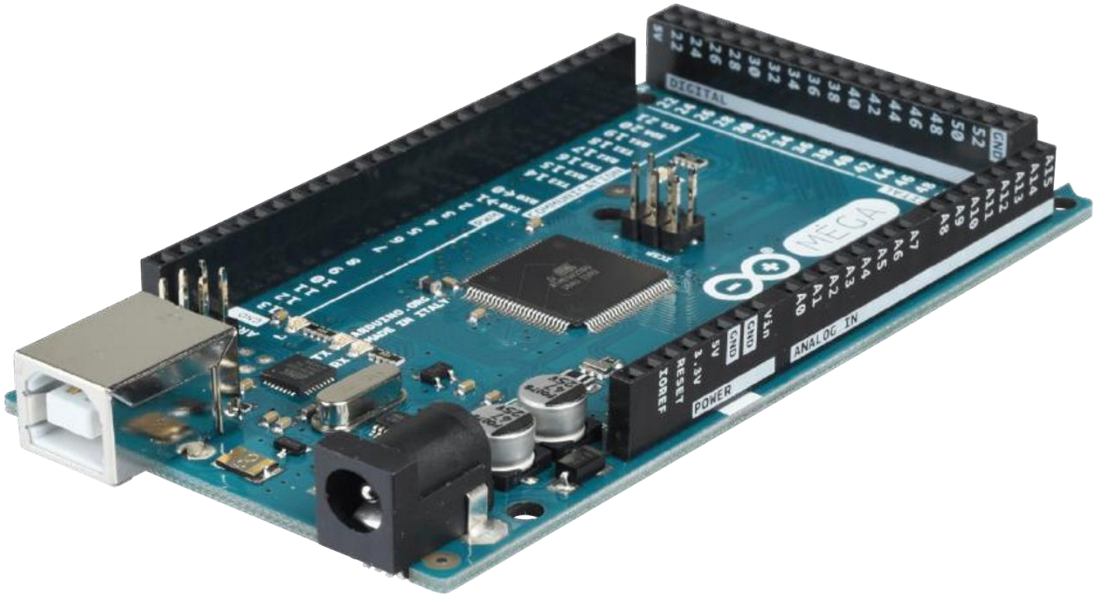
TRAFFIC MANAGEMENT USING IOT

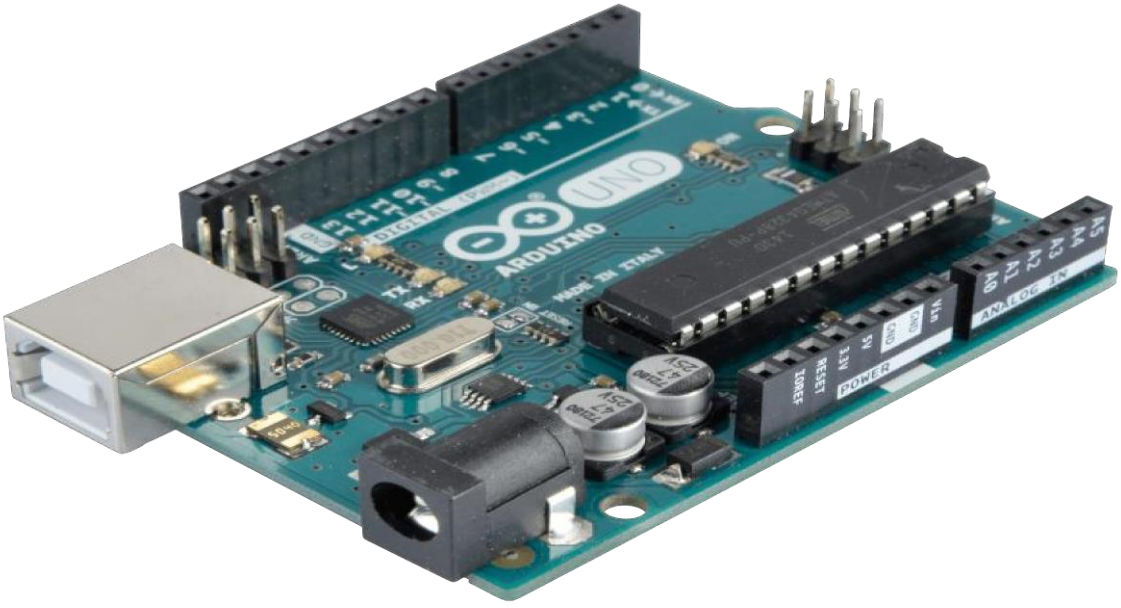
Hardware Components

1. **Microcontroller (Arduino Mega 2560)**: The Arduino Mega 2560 is a microcontroller board based on the Atmega 2560. It has 54 digital input/output pins (of which 15 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 2560 board is compatible with most shields designed for the Uno and the former boards Duemilanove or Diecimila.



Arduino Mega 2560.

2. **Microcontroller (Arduino Uno)**: The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328Pmicrocontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable.

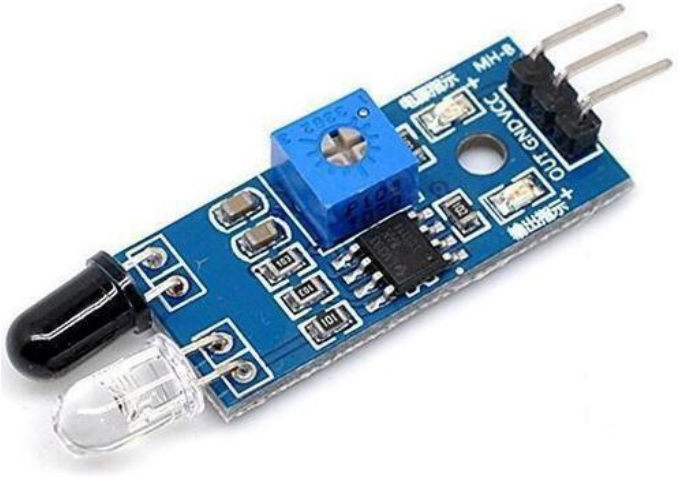


Arduino Uno.

3. **LEDs**: LEDs are used for the purpose of signaling according to the trac condition.

LED for Trac Lights.

4. **IR Sensor**: IR Sensor is used to count the vehicles on the road.



IR Sensors.

5. **Jumper Wires**: It is used to connect the components to each other.

Jumper Wires.

Software Requirement

1. **Arduino IDE**: The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, MacOS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino board.

The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures.

2. **Proteus Design Suite**: The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards.

P R I N C I P L E

Existing System

The exiting trac system is generally controlled by the trac police. The main drawback of this system controlled by the trac police is that the system is not smart enough to deal with the trac congestion. The trac police ocial can either block a road for more amount of time or let the vehicles on another road pass by i.e. the decision making may not be smart enough and it entirely depends on the ocial's decision. Moreover, even if trac lights are used the time interval for which the vehicles will be showed green or red signal is xed. Therefore, it may not be able to solve the problem of trac congestion. In India, it has been seen that even after the presence of trac lights, trac police ocials are on duty, which means that in this system more manpower is required and it is not economical in nature.(Viswanathan and Santhanam, 2013)

Disadvantages of Existing System

i) Trac congestion
ii) No means to detect trac congestioniii) Number of accidents are more
iv) It cannot be remotely controlled

v) It requires more manpower vi) It is less economical

Proposed System

The rst and primary element of this system is the wireless sensor nodes consisting of sensors. The sensors interact with the physical environment means vehicles presence or absence while the local server sends the sensors data to the central microcontroller. This system involves the 4*2 array of sensor nodes in each way. This signies 4 levels of Trac and 2 lanes in each way. The sensors are ultrasonic sensors which transmits status based on presence of

vehicle near it. The sensor nodes transmit at specied time intervals to the central microcontroller placed at every intersection. The Microcontroller receives the signal and computes which road and which lane has to be chosen based on the density of Trac. The computed data from Microcontroller is then transmitted to the local server through Wi-Fi connectivity. The controller makes use of the collected data to perform the Intelligent Trac routing. In this system, the primary aim is to gather the information of moving vehicles based on WSN to provide them a clear path till their destinations and trac signals should switch automatically to give a clear way for these vehicles.(Dave, 2018)

Advantages of Proposed System

i) Minimizes number of accidents. ii) Reduces fuel cost and saves time. iii) Low budget. iv) Easy implementation and maintenance. v) Remotely controllable.
vi) Minimizes hassle and cost of commuting.

Method

In this proposed system, the trac lights are LEDs and the car counting sensor is an ultrasonic sensor. Both blocks are connected to a Microcontroller using physical wires. The Microcontroller is the trac light controller which receives the collected sensor data and manages the trac lights by switching between green, yellow and red. The Microcontroller computes the number of cars in the street of the intersection it is monitoring based on the distances measured by the ultrasonic sensor and the timing between those measurements. The Microcontroller then sends the number of cars every minute to the local server. This communication is done using the Microcontroller serial port. The local server exchanges the data received with the cloud server in order to better predict the changes in timings of the trac light. This communication is done using Wi-Fi. More specically, the cloud server uses an equation that takes the data received (number of cars) as input then determines the time interval of LEDs needed for a smooth trac ow. This calculated time is then compared to the current actual time of the LEDs (this data is saved in a database on the cloud server). The server then comes up with a decision. If the current actual green time is less than the calculated time, the decision is to increase the green time, else to decrease the green time.(Chandana K K, 2013)

A View of Signals at Dierent Lanes

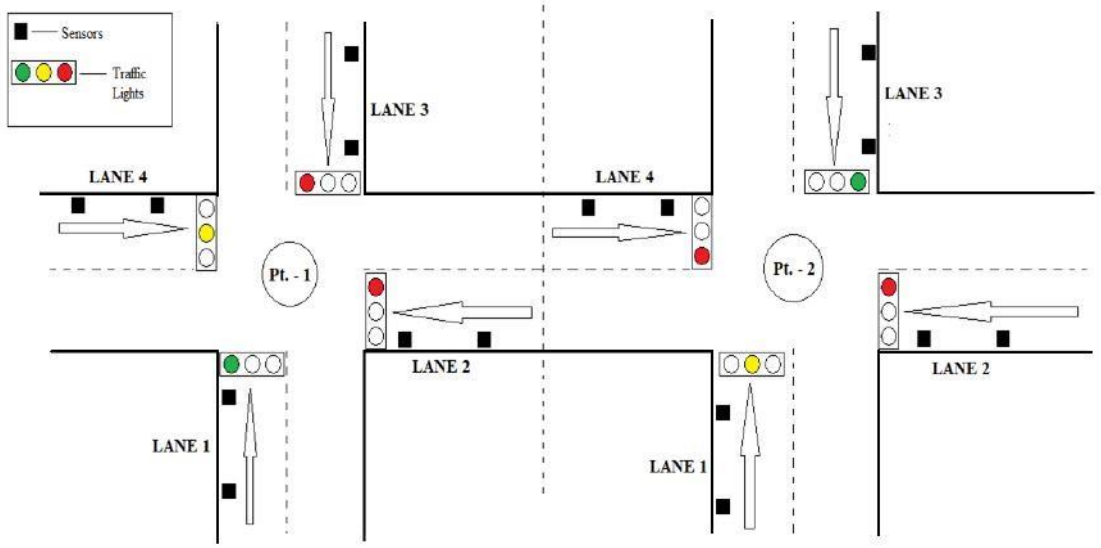
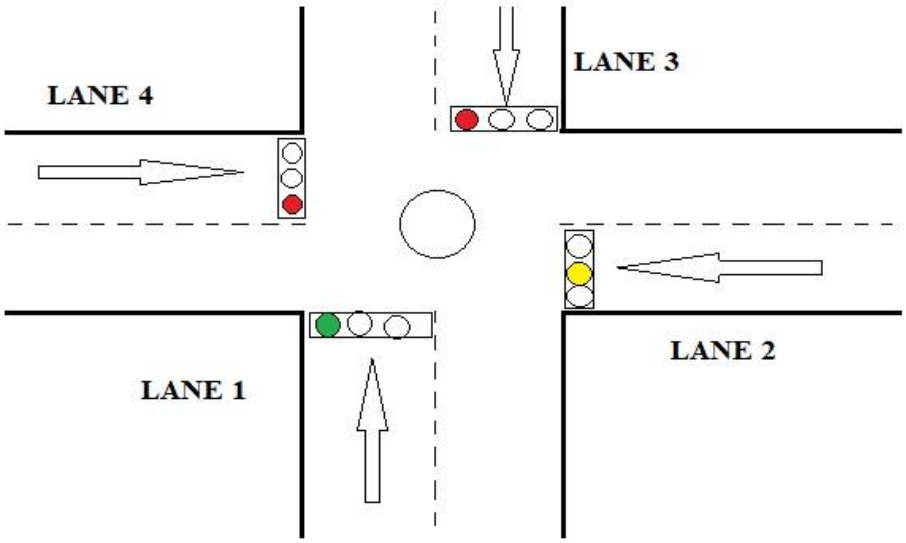


Figure 4.1: Control of previous Intersection

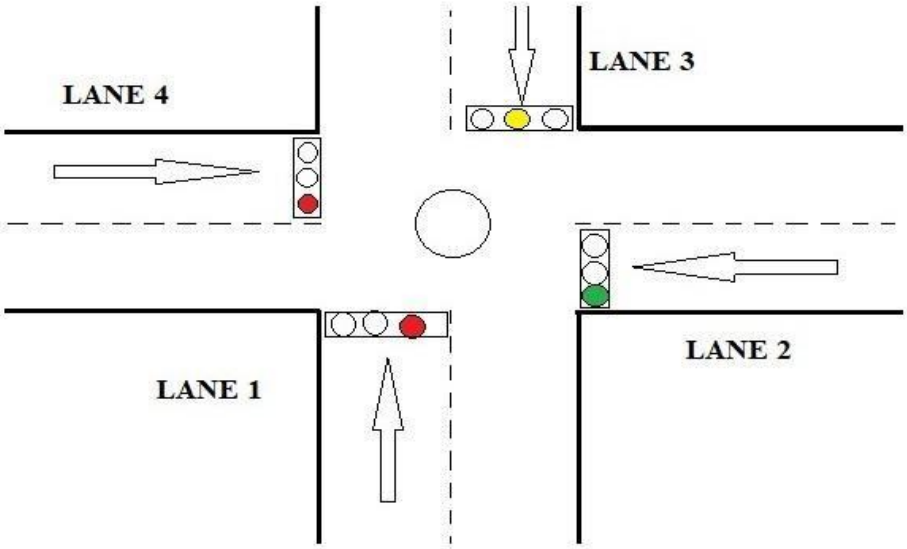
In the above gure, in Pt. - 1, LANE 1 is currently open with green signal and LANE 4 is ready with an yellow signal but LANE 2 and LANE 3 are blocked. In LANE 3, vehicle count is already greater than the threshold value, therefore the road coming to LANE 2 of Pt. - 1 is blocked in the Pt. - 2 itself. Thus re-routing them through another lanes. (Assuming that Pt. - 1 is the current intersection and

Pt. - 2 is the previous intersection.)



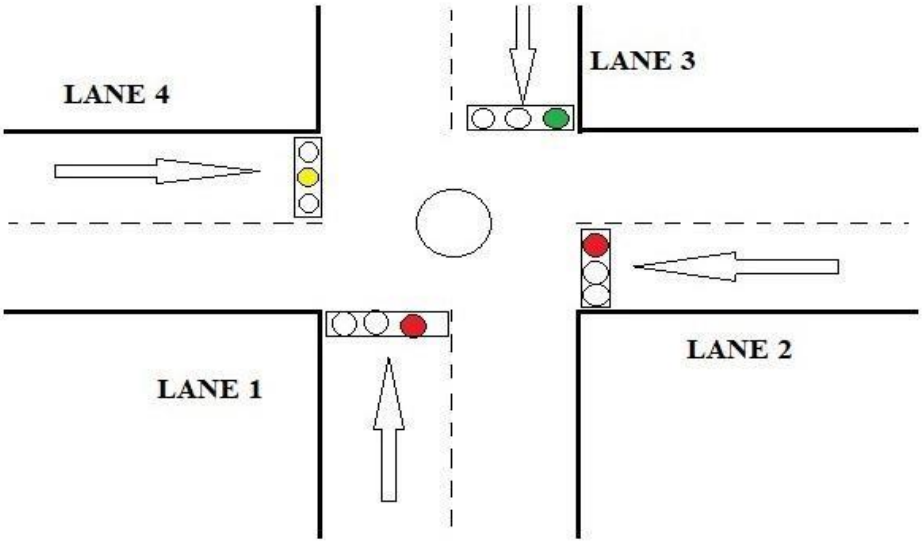
Signal at Lane 1

In the above gure, Lane 1 is open with green signal and other lanes are closed with red signal.



Signal at Lane 2

In the above gure, Lane 2 is open with green signal and other lanes are closed with red signal.



Signal at Lane 3

In the above gure, Lane 3 is open with green signal and other lanes are closed with red signal and after that Lane 4 will get the green signal automatically.