

## Detection and Rescue of Emergency Vehicles from Traffic Using RFID

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### Abstract

*Smart Traffic System enables us to detect and control the course of traffic. The aim of our system is to control the smooth motion of vehicles in the High Traffic lanes. Normal Traffic management system is not able to handle Traffic congestions. Here we are using different types of sensors to detect density of traffic and scans the Emergency vehicles to provide easy passage through the high traffic. Here we are using highly calculated algorithm to work, sensors will control traffic. The traffic density for future is estimated by this algorithm to minimize the traffic congestion. RFIDs are mainly used to set privilege levels of emergency vehicles like ambulance, fire brigade etc.*

**Keywords-** *Infrared (IR) sensor, RFID Sensor, Traffic Detector.*

### I. INTRODUCTION

One of the crucial things in smart cities is the Intelligent Transportation System (ITS). ITS helps Vehicle to vehicle and Vehicle to Infrastructure communication for better road facilities instead of increasing road capacities or constructing new roads. This is possible because of ITS, it deploys advanced data and communication, and this communication is used for decreasing traffic congestion and number of road accidents, which is very unpredictable in the urban areas. Controlling traffic signal time slots is crucial thing in the metro cities. Managing time slots of the signal decreases half time of the vehicles, resulting into less fuel consumption. This system, makes use of Infrared (IR) Sensors. IR sensors has 2 parts, one is transmitter and second is receiver. Transmitter transmits the light and receiver is used for receiving the light. When the connection between transmitter and receiver gets interrupted, counting process initiates i.e., when the receiver doesn't receive the transmitted light, then it can be concluded that the object is detected between transmitter and receiver. In this perspective, 'Line of Sight' concept is used.

### II. RELATED WORK

#### *1. Detection Unit and Dynamic time Management System:*

##### *A. Peak Time: [1]*

8:00 am to 10:00 am and 4:00 pm to 6:00 pm Density is very high on the roads results Dynamic coded algorithm on average has shown an improvement of about 35% above the Hard Coded system.

##### *B. Normal Time [2]*

This time the number of vehicles on road is in normal condition. So the need of hard coded system is not required. A dynamic system which alters itself and switches traffic lights according to density of vehicles would be best for these conditions.

#### *2. Overview of project modules*

*C. Traffic Light Module [3]*

Check the traffic on each lane at regular interval . Change signal from green to red if there is no traffic on that lane. Change signal from red to green for lane with more traffic.

*D. Emergency vehicle Module [4]*

Check if any emergency vehicle is coming or not. The emergency vehicles are provided with RFID Tags. The RFID reader will be placed below road surface. When any RFID tag will be read by the reader, which means the emergency vehicle is detected. Recognize the lane in which the vehicle is coming and check the signal. If the signal of that lane is red then turn it to green with giving some extra predefined time that makes the way for the emergency vehicle.

*E. Vehicle density Module [5]*

Infrared sensor monitors the density of vehicles. Send signal to controller vehicle density high or low. Controller change light and time of signal. DENSITY algorithm calculates the density of vehicle. Infrared sensor analyses the waiting vehicles and released vehicles. According to density which traffic signal must allot more time for green signal is calculated and vehicles released according to that.

**3. Experimental setup:***F. Sensor Requirements [7]*

- Arduino
- IR Sensor
- RFID
- LED
- Buzzer

*G. Arduino [8]*

The Arduino Uno is an open-source microcontroller board which works with microchip ATmega328p. The board has 14 digital I/O pins capable of PWM output. 6 analog I/O pins which programmed with Arduino IDE through B type USB. The power supply is given through an external 9-volt battery or through USB. Fig 2

*H. IR Sensor [9]*

An infrared sensor is an electronic device which emits to detect any objects in the given range. It has two sections transmitter and receiver section which are used to detect any obstacles in the path based on IR rays. The range is up to 20cm approx. It has adjustable sensing range and requires 20mA supply current. I/O pins are 5V and 3.3V compliant. 5v DC operating volt .Fig 3

*I. RFID Sensor [10]*

Radio-Frequency Identification makes use of electromagnetic fields for automatic identification and tracking of tags installed in objects. It has small radio transponder, a transmitter and radio receiver. These are of 2 categories. Active tags which are powered by using batteries and Passive ones from energy of interrogating radio waves of RFID reader. Fig 4

**III. WORKING AND CONCEPT**

We are using Infrared sensors, RFID Sensors, Arduino to observe the 4-way traffic density. Each track has 2 IR sensors, IR sensor detects the obstacles, mainly, it works on the proximity principle, It consists of IR Receiver and IR transmitter, in which IR transmitter transmits IR Light which on

detection of any obstacle, reflects back the same IR light and falls on the Receiver LED. Based on the reflected light, we monitor the traffic density according to the number of IR Sensors Sensed.

- If there is obstacle in 1<sup>st</sup> IR sensor then the traffic is between 50 meters. It means traffic density on the lane is in Normal condition.
- If both infrared sensors detects obstacle then the traffic is above 100 meters. It means traffic density on the lane is more. Then the green light will glow for more time to reduce the traffic on that lane.

The RFID tag is positioned under vehicle. When an emergency vehicle travel across the path, the RFID reader detects the vehicle's ID and transmits the information using wired network. After receiving the data at the receiver side, the Microcontroller controls the traffic light. This way the traffic light turns green in order to provide way to the ambulance. After the ambulance passes the traffic junction, the signal will operate normally. Thus the time required for the ambulance to get to location is drastically reduced improving the survival chances of patients.

#### IV. ALGORITHMS

##### 1. Density Based Algorithm:

- Density based clustering algorithm is important in finding nonlinear structure based on density.
- In this project, we make use of two Infrared sensors say A and B which are set at a distance of 50 meters and 100 meters from the signal respectively.
- If the IR sensor A detects the obstacle which implies that the traffic is above 50 meters and less than 100 meters.
- In this case the green signal for that lane extends to 4 seconds from 2 seconds.
- If IR sensors A and B detects the obstacles, it implies that the traffic is above 100 meters or at least 100 meters.
- In this case the green signal for that lane extends to 6 seconds from 2 seconds.
- Thus traffic signals changes dynamically which helps to reduce the congestion.

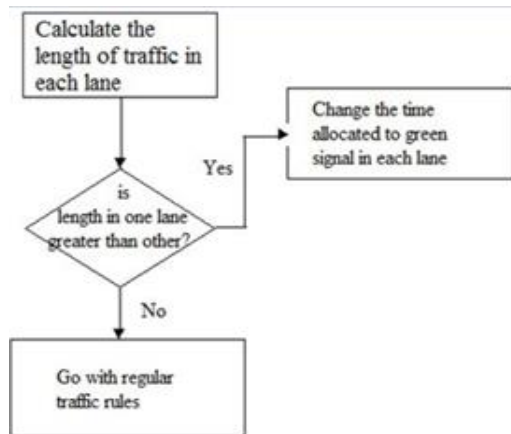


Figure 1: Density based algorithm

## 2 .Emergency Based Algorithm :

- When an emergency vehicle travel across the path, the RFID tag is positioned under Vehicle.
- The RFID reader detects the vehicle's ID and transmits the information through wired network.
- On receiving the information at the receiver system, the Microcontroller controls the traffic light.
- This way the traffic light turns green in order to give way to the ambulance. After the ambulance crosses the traffic junction, the signal will operate normally.
- Thus the time required for the ambulance to reach its destination is rigorously shortened increasing the survival chances of patients.

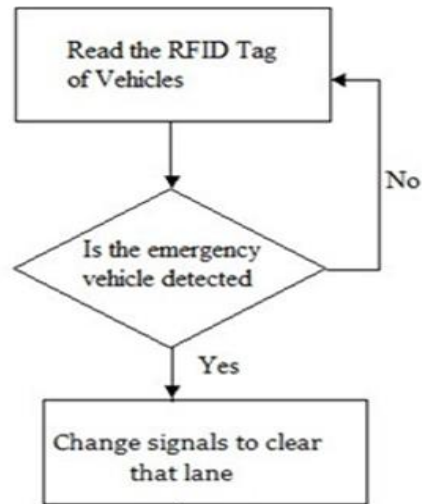


Figure 2: Emergency based algorithm

*3. Normal Traffic Algorithm:*

- Normal Traffic works on fixed timing.
- One of the lane is green Light while the other three are red light.
- Switching of green light according to clock wise and anticlockwise direction.

*4. Warehouse/Industrial Zone Algorithm:*

- If any traffic comes from Industrial area then the algorithm for this system will be changed.
- Green light is more for heavy vehicles coming from Industrial area.
- Traffic light can be change according to the traffic coming from Industrial .

**V. RESULT**

The purpose of this Smart Traffic Management System is to eliminate the drawbacks of High Traffic jam situations. Besides it is lucrative than the current system. By using RFID sensor we can help Emergency vehicles to pass through high traffic.

**VI. FUTURE SCOPE**

In future advancement of Smart Traffic Management, we can able to pass through high traffic routes quickly. The ambulance will be capable to communicate with all the junctions to prevail an open track for

reaching the hospitals in accurate time. The principal goal is to regulate the traffic in order to reduce the waiting time of the drivers.

## VII. FIGURES AND TABLES

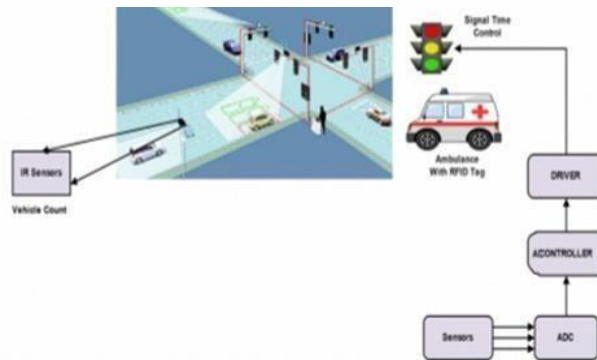


Figure 3. Architecture of the System

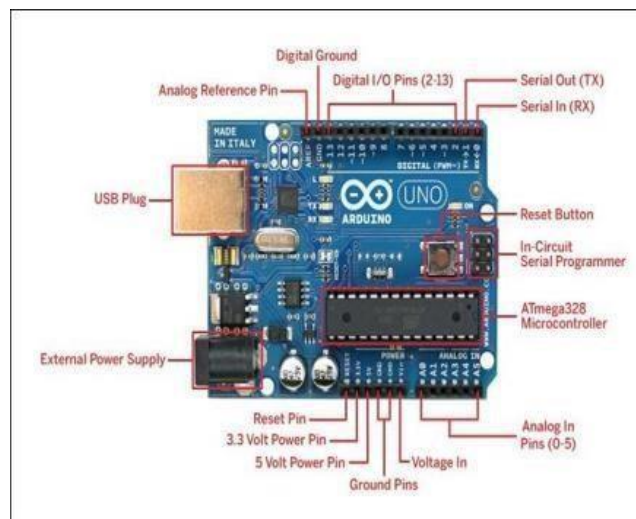


Figure 4: Arduino Pin Diagram

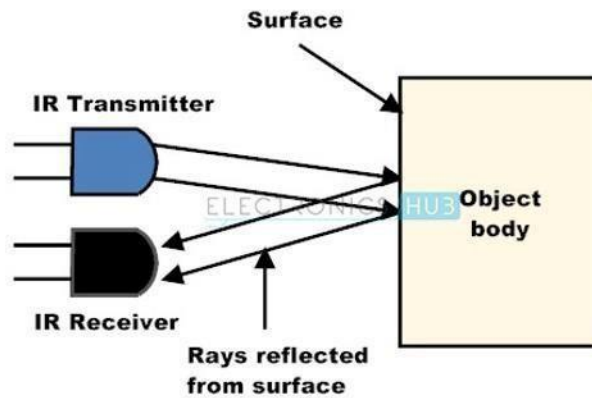


Figure 5: IR sensor

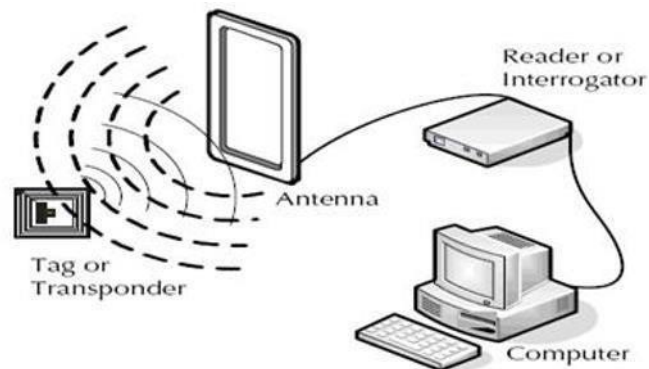


Figure 6: RFID diagram

## VIII. CONCLUSION

Smart signal project is very beneficial to people. In this proposed solution high density traffic will be assigned with long timing on the signal, low density traffic will be assigned with short timing on the signal. Sensors sense the density of vehicles along with Emergency vehicle and assign the time. The traffic congestion is vital issue which creates troublesome for government as well as people. The impact of low traffic management system affects the economic, health, financial, and environmental zones. Here we proposed the solution which provides efficient density based traffic management system along with detection of emergency vehicles using RFID tag.

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