Smart Ambulance with Traffic Control

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Abstract : The expansion of industrialization and urbanization has led to an immense increase within the population invariably leading to rise within the quantity of vehicles on road. Due to heavy traffic, an emergency vehicle stuck in traffic is unable to cross the signal due to poor traffic signal controller. This project aims at providing solution to the above problem by altering or controlling the traffic light before the ambulance reaches the traffic signal using the concept of Internet of Things (IOT).This system uses a central server to manage the traffic controller. The Ambulance driver uses the android application to request the traffic controller to make signal green during which lane the ambulance is present.

IndexTerms - **Ambulance, traffic signals, priority, criticality, RFID reader, IoT**

I. INTRODUCTION

The main thought behind the paper is to provide a sleek flow for the ambulance to succeed the hospitals in time and thereby minimizing the delay caused by traffic jam. The traffic in cities has been exponentially increased due to an outsized of vehicles plying on the road. Due to this significant traffic, often traffic jams occur on roads due to which the emergency vehicles like ambulance and fire engines grind to halt in traffic which can be the cause for losing human lives.

Current traffic control systems are a static case wherein vehicles have gotten to await for a predefined amount of some time until the microcontroller switches the green light for that lane. If the car is stuck around the stoplight, then the traffic police can give priority to the ambulance by giving necessary symbol or signs to the vehicles in order that the ambulance can get out of the traffic as quickly as possible.

Moreover, if the emergency vehicles area unit stuck during a lane distant from the stoplight, the siren of the ambulance is unable to achieve in the traffic police, during this case the emergency vehicles need to wait until the traffic gets cleared or we have to depend upon other vehicles to maneuver aside which is not an simple task in traffic situations.

The project proposes a system where, ambulance driver uses an android application to request the traffic controller to form the signal green for the lane during which the ambulance is present.

II. LITERATURE REVIEW

i. SMART AMBULANCE GUIDANCE SYSTEM

In this paper, they need used a central server to control the traffic controllers. The traffic signal controller is implemented using Arduino UNO. The ambulance driver uses a web application to request the traffic controller to make the signal green during which the ambulance is present

ii. ADVANCE ALERT MECHANISM FOR AMBULANCE PASS BY USING IOT FOR SMART CITY

This paper analysis essentially uses the prevailing technologies along side the concept of Internet of things (IoT). The architecture used is server-client architecture. The client may be a user using an android application.

iii. MICROCONTROLLER BASED RFID SYSTEM

The project is used to change the traffic signals upon arrival at traffic light junction. The system creates an android app that connects both the ambulance and therefore the traffic signal station using cloud network. This technique makes use of Radio frequency identification technology to implement the intelligent traffic signal control. The essential plan behind the projected system is, if the Ambulance halts on the way due to a traffic signal, RFID installed at the traffic signal tracks the RFID tagged ambulance and sends the info to the cloud.

iv.　IOT-BASED STOPLIGHT MANAGEMENT TECHNIQUE FOR SERVING TO EMERGENCY VEHICLES

This project proposed the utilization of GSM, Arduino, Android mobile system. The proposed method enables the emergency vehicles to signal the traffic signal controller placed within the traffic junction regarding their arrival so as that the traffic is going to be regulated. This system needs the users traveling within the emergency vehicle to signal the traffic controller hardware through the application deployed in their mobile phones.

III. SYSTEM DESIGN AND ARCHITECTURE

The basic aim of this paper is to develop an android application, which is usedd by ambulance driver to control the traffic signal and skip the traffic based on criticality.

- The Idea behind is to prioritize the ambulance when there is two ambulance encountered on either side of the lane.
- The whole system is split into three parts. Their description is as follows.

1) Android Application: An android application is supposed for the ambulance driver and Admin. The application provides a user interface for the ambulance driver to login to the system and register patient information. Ambulance location data is tracked using GPS and sent to the Admin. Admin can view the driver details, ambulance requests and current location of ambulance. The criticality of patient is then sent to admin from which the admin schedules the ambulance to switch the traffic signal based on criticality.

2) RFID reader: A RFID reader is used, which acts because the medium of communication between the traffic signal and thus the ambulance. RFID tags are often read if passed near a reader, even if it is covered by the thing or not visible. The input to the RFID tags is given manually and thus the priority is also entered manually by Admin. The RC522 RFID module that consists of RFID reader, RFID card is used.

3) Traffic Signal: Arduino Nano board interfaced with RFID-RC522 Wi-Fi module is used as a traffic signal. The Arduino module is programmed to fetch the info from the RFID reader. The traffic signal looks for an interrupt from the RFID tags i.e. a request from the ambulance with highest priority to show a selected lane to green. If there is a request, then that lane is turned off till the ambulance leaves. Then the traffic signal resumes from where it left off.
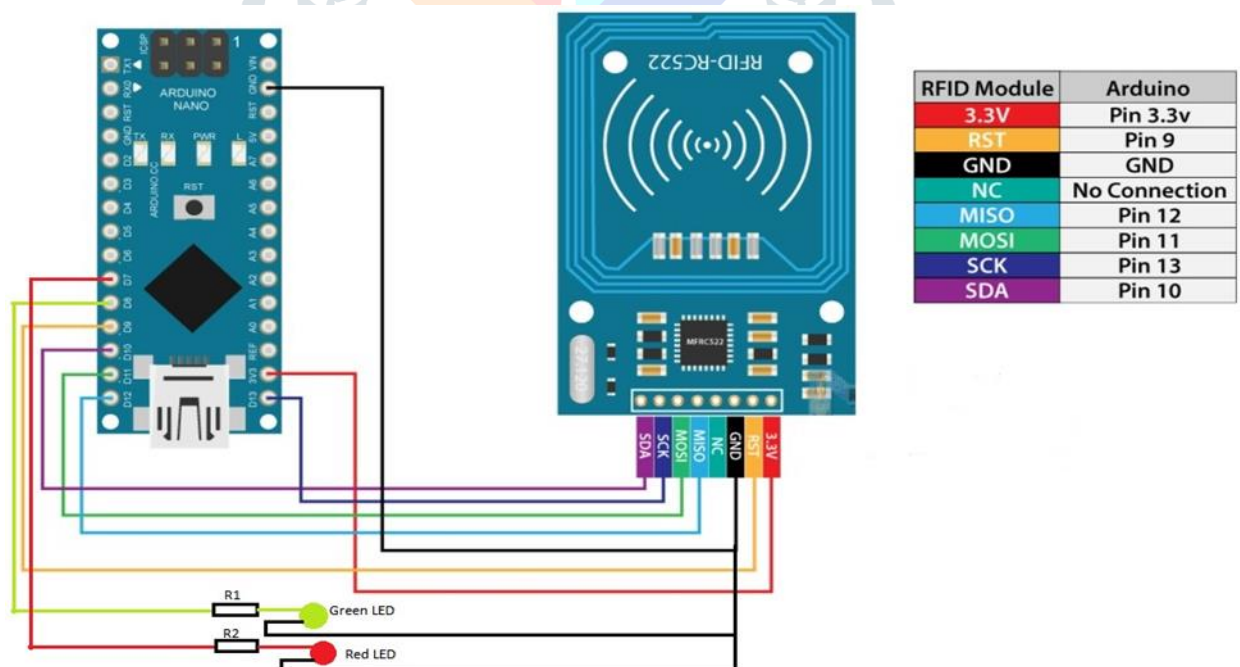

RFID Module	Arduino
3.3V	Pin 3.3v
RST	Pin 9
GND	GND
NC	No Connection
MISO	Pin 12
MOSI	Pin 11
SCK	Pin 13
SDA	Pin 10

Figure 1: Hardware Architecture

IV. IMPLEMENTATION

1. HARDWARE IMPLEMENTATION

I.　Arduino Nano : The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P. It offers the same connectivity and specs of the UNO board in a smaller form factor. This module is programmed to fetch data from RFID reader.

II.   MFRC522 : The RC522 is a RF Module that consists of a RFID reader, RFID card and a key chain. The module operates 13.56MHz which is industrial (ISM) band and hence can be used without any license problem. The module operates at 3.3V typically and hence commonly used in 3.3V designs. It is normally used in application where certain person/object has to be identified with a unique ID.

III.   LEDs and Resistors : These are used to implement traffic signal with 3 colours red, yellow and green. This looks for an interrupt from RFID tag to switch the traffic signal to green.

2. SOFTWARE IMPLEMENTATION

The traffic light has to do its normal functioning until it receives an interrupt from the ambulance to turn on a specific lane. Programming is done using the Arduino software.

The algorithm is as follows:
1. Initialize GPIO pins.
2. Activate normal sequence of the lights.
3. Check for an interrupt from the RFID reader, if yes go to step 4 else go to step 2 .
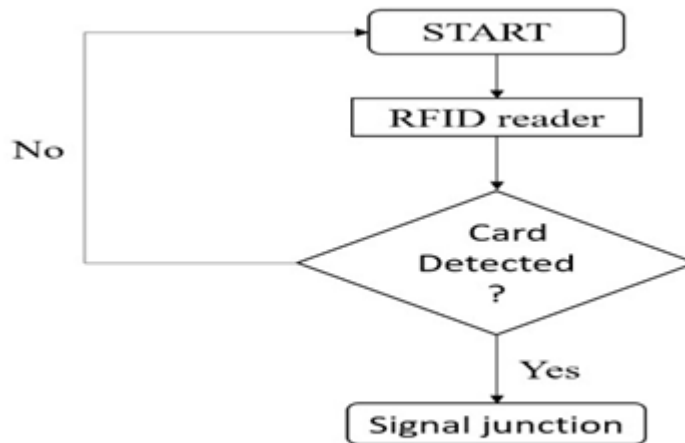4. Turn on green signal for the lane requested by the ambulance.

Fig 2. Working of Hardware

WORKING OF ANDROID APPLICATION

- Android application provides user interface to both ambulance driver and Admin.

- User first must login to the system using username and password for authentication.

- If the user is ambulance driver, they will register patient information and send their current location to Admin.

- Also, driver can enter patient's condition whether patient is just too critical or less critical.

- Admin can view ambulance request list and send response to driver by manually prioritizing the ambulances to modify the signal.
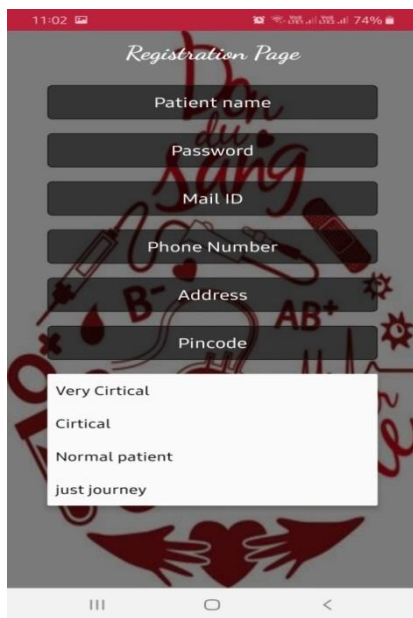
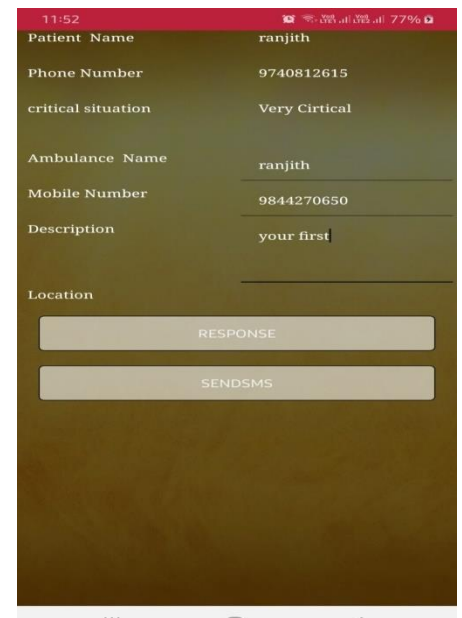| Figure 3. Patient Registration | Figure 4. Request List | Figure 5. Response by Admin |

IV. CONCLUSION AND FUTUREWORK

In this world of busy roads, traffic lights plays the vital think about in saving person's life. Death due to ambulance delay is one among the important issues which is faced by most of the countries within the world. This paper implements the planning of a replacement concept of Smart ambulance with Traffic Control System. During the emergency situation, the Traffic signal switches to green and allows the ambulance to undergo the road intersections. This method can help the ambulance to reach the hospitals with lesser time consumption.

This model is developed with the aim to assist the ambulance reach hospital as early as possible. It are often enhanced further in some ways. Few of them are as follows:

- Considering various traffic scenarios and how this system will respond to them.
- Sending the patients data to the hospital before reaching in order that the required arrangements are often done.
- The RFID tag unique ID can be entered automatically to the software.
- The software and hardware can be integrated using online database.
- Prioritising can be made automatic.

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