Zero Traffic for Emergency Vehicles

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Abstract: - The problem of urban traffic stoppage is invariably spreading. The increased traffic is due to the increasing number of vehicles and the limited expansion of the roads. We propose a system to reduce traffic congestion by using sensors to detect Ambulance. The system will detect through sensors instead of using image processing. We also plan to provide a suitable solution for emergency vehicles stuck in traffic to clear their way using the Ambulance indicator thus ensuring timely assistance to those in need. The main motto behind our project is to provide a smart way to control traffic lights and also to provide a smooth flow of ambulances to the hospital in time. We will be implementing a new mode called «ambulance mode» that will control the traffic lights on the road of the ambulance. The program is fully automatic so it controls the traffic lights, helping to get to the hospital in time. This is not just a priority for ambulances. It is preferred for other emergency vehicles such as fire trucks.

Key Words: —*RFID tags, RFID reader, Ambulance, Arduino Uno.*

I. INTRODUCTION

Traffic congestion and the management of tidal currents were recognized as major problems. In India, as the population is increasing day by day, the traffic is also increasing with proportionality. Thus, traffic lights need good coordination for the flow of traffic during rush hour. In addition, the road accidents in the city have been relentless and exposing the loss of life due to the accidents is even more crucial. In this fast-paced world, we are forced to rush, making traffic jams and accidents inevitable. In INDIA, every time an ambulance arrives, it is manually controlled at the intersection by a traffic officer. Nowadays, all systems work automatically. Therefore, we have proposed a system called "emergency vehicle clearance using blue mode". An emergency vehicle is a vehicle used by emergency services to respond to an incident. Vehicles are typically operated by designated agencies which are often part of government, but can also be non-governmental organizations and commercial companies specifically authorized by law. Emergency vehicles can be exempted from certain conventional traffic rules in order to reach their destination as quickly as possible, such as crossing an intersection when the light is red or exceeding the speed limit. In some states in the United States, however, the driver of an emergency vehicle can still be sued. He shows a "reckless disregard for the safety of others. There are many types of emergency vehicle, dependent on jurisdiction. Some examples of emergency vehicles include Ambulance, Fire engine, Police vehicles etc.

Fig.1. Four-way Traffic Junction

II. LITERATURE SURVEY

The implementation of smart technology in the transportation system can have a big impact on traffic lights, especially for emergency and authorized vehicles. Compatible techniques used to control traffic lights provide a clear path for emergency vehicles and will allow emergency vehicles to reach the emergency site more quickly. Smart traffic light control is the

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best way to detect vehicles. The system controls traffic at multiple junctions and follows multinational standards for the operation of traffic lights. It works with a central monitoring station designed to monitor all access nodes. Using correct data collection for both intersections and preferring an interagency traffic control system, emergency vehicles pass quickly from these two intersections and face less traffic and at the same time, collisions will be avoided. The traffic light is designed to ensure well-organized traffic throughout the city. Due to traffic jams, high priority vehicles also face problems on the road. A new offer on the traffic light control system to help the traffic administration command deals with traffic control in urban areas. The main concept is to control traffic and give passage to vehicles of emergency such as ambulances and to clear a road so that the police officer reaches his destination on time. The traffic control system has been dealt with the problem of traffic jams. The main urban problem today is traffic congestion. RFID traffic control avoids the problems associated with traffic control systems. It was a challenge is to avoid traffic in transport. The RFID technique faces a multitasking challenge, which means that its role was very important in the traffic control technique. This was the major impact on vehicles dealing with an emergency vehicle in an emergency situation. This system has been very useful in an emergency. Vehicles without any human effort. A semi-manual method used the fixed internal traffic light. The traffic control system to easily pass emergency vehicles using RFID and IOT applications. One system uses microcontroller, an RFID reader to detect RFID tags attached to the vehicle. RFID with radio frequency and Internet technologies is also expected to create a revolt in the traffic control system and it helps to keep valuable information on the database records.

III. PROPOSED METHODOLOGY

This project consists of three phases:

- Installation of RFID Detectors.
- Detection of Emergency Vehicle.
- Communication b/w RFID Detectors and traffic control systems.

We make use of this concept in our project to clear the traffic congestion. Traffic is cleared using detection of RFID installed in Emergency Vehicles. RFID is the synchronization of traffic signals and our control system will provide a way for ambulance in lane through RFID technology. RFID readers, which will identify Emergency Vehicle on roads.

Detecting the Ambulance: This phase involves RFID TAGS and RFID READERS, TAGS are active once the ambulance is near the signal. A radio frequency signal to the RFID READER module thereby guiding the traffic signal to change accordingly. The codes are installed in RFID TAGs with which the main module (Arduino Microcontroller) to change the traffic signals. This would make the system more secure and reliable and RTC (Real time clock) used to provide the sequence and delay to the traffic signal lights. The input of the RTC is connected to the Arduino Uno. Power supply module is used to provide the supply of 9V Input to the controller.

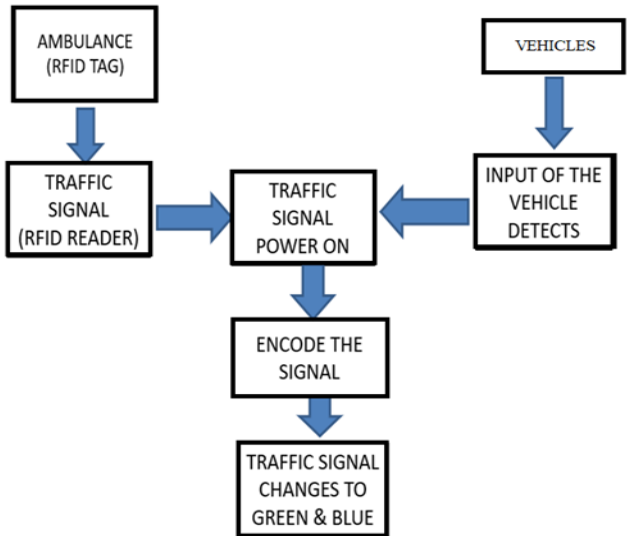

Fig.2. Block Diagram of the System

A. Architecture

This project is divided into three modules:

Module 1:

In this Module, RFID Tags will be installed in the vehicles and RFID readers will be in the Traffic signals.

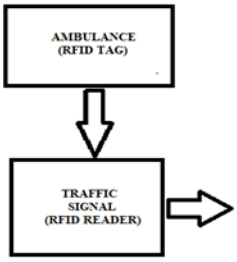

Fig.3. Module 1

Module 2:

This module has vehicles without RFID Tags, which will not be detected by the Traffic signals.

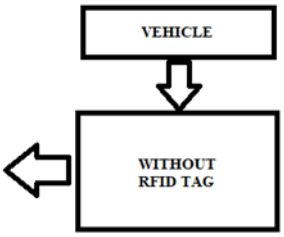

Fig.4. Module 2

Module 3:

This module is the main module where the output of Module1 and Module 2 will be connected to the Arduino Microcontroller and further the Decoder will decode the code of microcontroller. According to code, it will give the appropriate Traffic signals.

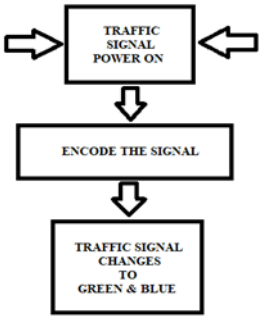

Fig.5. Module 3

After connecting the entire Module together, the desire output will get.

B. Radio-Frequency Identification

RFID Radio-frequency identification (RFID) uses magnetic force fields to mechanically determine and track tags connected to things. AN RFID system consists of a tiny low radio electrical device, a receiver and transmitter. Once triggered by a magnetic force interrogation pulse from a close-by RFID reader device, the tag transmits digital knowledge, sometimes a characteristic inventory range, back to the reader. This range are usually accustomed track inventory merchandise.

There are two styles of RFID tags: 1-Passive tags are super charged by energy from the RFID reader's interrogating radio waves. A battery supercharges 2-Active tags and so are usually browse at a bigger vary from the RFID reader, up to several meters. RFID tags are utilized in several industries. as an example, AN RFID tag connected to AN automobile throughout production are usually accustomed track its progress through the assembly line, RFID-tagged prescription drugs are usually tracked through warehouses, and implanting RFID microchips in stock and pets permits identification of animals. Tags can also be used in retailers to expedite checkout, and to prevent larceny by customers and staff.

Fig.6. RFID tags

RFID tags are created out of 3 pieces: a semiconductor unit (computer circuit that stores, processes info, modulates, and demodulates radio-frequency (F) signals).AN antenna for receiving and sending the signal and a substrate. The tag info is kept throughout a non-volatile memory. The RFID tag includes either fastened or programmable logic for process the transmission or detector knowledge, severally. RFID tags are usually either passive, active or battery-assisted passive. a vigorous tag has AN on-board battery and sporadically transmits its ID signal.

A battery-assisted passive tag options a little battery on board and is activated once inside the presence of an RFID reader. A passive tag is cheaper and smaller as a result of it is no battery; instead, the tag uses the radio energy transmitted by the reader. The RFID tag receives the message then responds with its identification and different info.

This could be solely a singular tag serial range, or might even be product-related info sort of a stock range, heap or batch range, production date, or different specific info. Since tags have individual serial numbers, the RFID system style will discriminate among many tags which can be inside the vary of the RFID reader and skim them at the same time. Uses: AN RFID tag are usually affixed to AN object and accustomed track and manage inventory, assets, people, etc. as an example, they go to be affixed to cars, PC instrumentation, books, mobile phones, etc.

C. RFID Reader

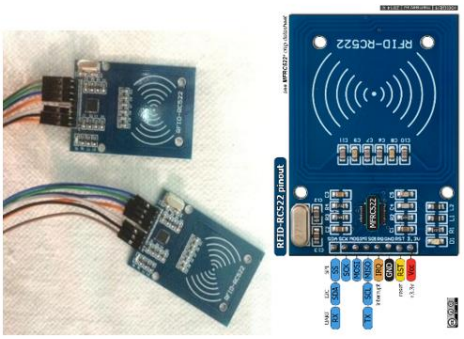

Fig.7. RFID readers

MF RC522 is a highly integrated read and write card chip applied to 13.56MHz contactless communication. Launched by NXP Company, it is a low voltage contactless card chip, low cost and small size, a best choice. MF RC522 uses advanced modulation and demodulation concept fully covered in all kinds of 13.56MHz passive contactless communication methods and protocols. In addition, it supports fast CRYPTO1 encryption algorithm to verify MIFARE products. The MFRC522 also supports MIFARE high-speed contactless communication chain, with bidirectional data transfer rates up to 424kbit/s.

D. Arduino UNO

Arduino Uno is based on the Microchip ATmega328P microcontroller and was developed by Arduino. The board contains sets of digital and analog input / output pins that can be connected to various expansion shields and other circuits. The board has 14 digital and 6 analog I / O pins and is programmable using the Arduino integrated development environment using a type B USB cable. The word «Uno», which means «one» in Italian, was chosen for the initial release of Arduino software. The Uno board is the first in a series of USB-based Arduino boards to be version 1.0 of the Arduino IDE reference version of the Arduino, which has now evolved into newer versions. While the Uno communicates using the first STK500 protocol, it differs from all previous boards in that it does not use an FTDI USB-serial driver chip will supply voltage through this pin, or if you are supplying voltage through the device connector, access it through this pin. The board can be damaged if the supply voltage via the 5V or 3.3V pins bypasses the controller. The maximum current taken by 3V3 is 50 mA. They work at 5 volts. The maximum current of 40 mA must not be exceeded on any input / output pins to avoid permanent damage to the microcontroller. By default, it measures from five volts from ground, although it is possible to change the upper end of the range using the AREF pin and thus the analog reference function. These pins are connected to the equivalent pins of the serial USB chip on TTL ATmega8U2.

Fig.8.Arduino Uno

E. DS 3231 RTC Chip

At the centre of the module could also be a low-cost, extremely accurate RTC chip from Maxim – DS3231. It manages all timekeeping functions and features a simple two-wire I2C interface that can be easily interfaced with any microcontroller of your choice. The chip maintains seconds, minutes, hours, days, dates, months, and year's information. The date at the highest of the month is automatically adjusted for months with fewer than 31 days, including corrections for leap year (valid up to 2100). The clock operates in either the 12-hours or the 24-hours format with an AM/PM indicator. It also provides two programmable time-of-day alarms. The other cool feature of this board comes with an SQW pin, which outputs a pleasing square wave at either 1Hz, 4kHz, 8kHz, or 32kHz and should be handled programmatically. this may further be used as an interrupt because of alarm consistently in many time-based applications.

Fig.9. RTC DS3231

Battery backup: The DS3231 incorporates a battery input, and maintains accurate time keeping when the main power to the device is interrupted.

The built-in power-sense circuit consistently monitors the status of VCC to detect power failures an automatically switches for the backup supply.

F. Power Source Module

This module may be a straightforward flexible to use module that's powered by 6V to 12V DC input, and provides three fixed DC outputs: 3.3V, 5.0V, and a third output which may be direct connection to the DC input. Perfect for providing support power for your electronic design, every DIY hobbyist should have a few of those flexible power supplies on their electronics workbench. They can even be used as a multi-output fixed voltage DC power supply in equipment designs. The AMS1117 voltage regulators utilized in this module are linear voltage regulators and may get extremely popular when dissipating higher currents with larger voltage drops. The actual maximum output current is restricted by the facility dissipation ability of the device. Although this application note addresses a special module, the calculations are comparable. Specifications: Input voltage: DC 6V - 12V on standard 5.5mm outer / 2.1mm inner barrel connector. Outputs: 3.3V DC at 800mA maximum current, 5.0V DC at 800mA maximum current, 12V D C (the 12V output is directly connected to the input, i.e. with 12VDC input, this output are going to be 12VDC; with 9VDC input, this output are going to be 9VDC) Output power on/off switch. Two-row multiple pin outputs, easy to connect and use. Red LED glow when input DC power is supplied and output is turned on. PCB size: 30mm x 31mm.

Fig.10. Power Supply Module

G. Arduino IDE

The open-source Arduino Software (IDE) makes it simple to write code and upload it to the board. This software can be used with any Arduino board. The Arduino Integrated Development Environment (IDE) is a cross-platform application that is written in functions from C and C++. It will used to write and upload programs to Arduino compatible boards and also with the help of third-party cores, other vendor development boards. The Arduino IDE supplies a software library from the Wiring project, which gives many common input and output procedures. The Arduino IDE employs the program avrdude to convert the concludable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

Fig.11. Arduino IDE software

IV. RESULTS AND DISCUSSION

- Emergency vehicle will be detected in advance.
- This can be extended to n number of signals so that the emergency problems will be solved as soon as possible.
- This system can be implemented for a larger network by using encryption algorithm to ensure safety and stability of the system.
- Precious lives and properties can be saved.

This picture indicates the normal traffic signal sequence.

- Here no Emergency Vehicle has been detected.

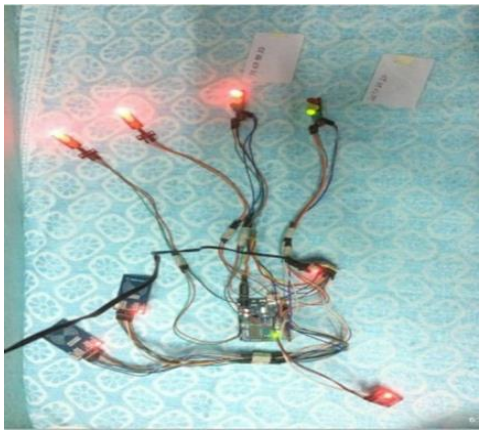

Fig.12. Normal Traffic Signal

- This figure shows the working of RFID READER installed in the Path A signal, Whenever Ambulance (with RFID tag) is detected in Path A signal, the traffic light turns from red to green and blue.

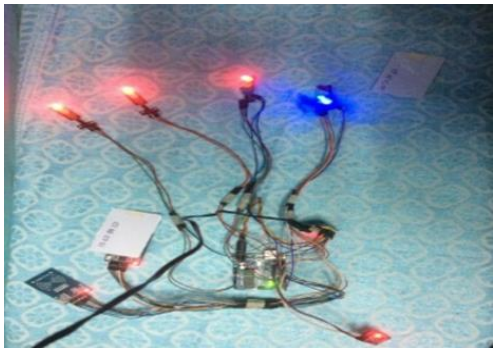

Fig.13. Traffic Signal When Ambulance Passes from Path 'A'

- Here, the ambulance, which is attached with RFID tag is sensed at the Path C by RFID Reader and the Path C traffic light turns into green and blue mode.

Fig.14. Traffic Signal When Ambulance Passes from Path 'C'

V. FUTURE ENHANCEMENT

In future enhancement of this project we can extend the distance of the RFID reader by installing large frequency RFID readers. In addition to this we may face the situation of priorities that means for example two ambulances occurs at same time at different path signals. In this situation, we should decide the priority between the two ambulances. The first priority is given to the ambulance, which the RFID reader detects, and the signal light turns from red to green and blue. After that when the first detected ambulance exits through the signal immediately second ambulance path signal light should turn from red to green and blue. To implement this, we can install another RFID reader to detect the exit of the ambulance that turns the signal lights from green, blue to red immediately after the ambulance exits.

So, two RFID readers can be used to detect the entry and exit of the ambulances in future implementation.

VI. CONCLUSION

As a conclusion, the implementation of smart technology in the transportation system can produce a great impact on traffic levels especially for the emergency vehicles. To avoid traffic congestion for emergency vehicles, we propose a system for reducing traffic congestion using sensors to detect the Ambulance. The main motto behind our project is to provide a smart way of controlling traffic light timing and to provide smooth flow for the ambulance to reach the hospital in time. This is the best technique to control the traffic light for emergency vehicles. In this project, the RFID technique is used convoys to avoid being stuck in the traffic congestion. This scheme is fully automated thus it controls the traffic lights, helping to reach the hospital in time. This is not preferred only for ambulance. It is preferable for other emergency vehicles such as fire engine.

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