INTELLIGENT TRAFFIC CONTROL SYSTEM FOR EMERGENCY VEHICLE USING RF TECHNOLOGY

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Abstract - *Road traffic congestion becomes a major issue for highly crowded cities. Emergency service vehicles (like: Ambulance, Fire truck) are one of the major services which gets affected by traffic congestion. To smoothen the movement of these vehicles we have come up with the solution of "Intelligent Traffic Control System for Emergency Vehicles". Here the traffic lights and the emergency vehicles are connected wirelessly by RFID (Radio Frequency Identification) technology which has the range of 10 meter and we can increase the range by using other wireless technology like Zigbee. The basic idea behind the proposed system is, if any emergency vehicles halts on the way due to heavy traffic congestion, RFID installed at the traffic signal (Receiver) detects the RFID tagged vehicle (Transmitter) and sends the data to the Arduino Uno microcontroller (ATmega 328P). The controller IC used here operates the traffic light according to the received data from receiver. Then the particular signal is made Green for some time, till the vehicle passes by the signal and it regains back to its original flow of signalling sequence. This system sends commands to microcontroller for controlling the traffic lights and reduce delay time in emergency periods. Thus, it acts as a life saver project.*

Key Words: Microcontroller, RF Transmitter, RF Receiver, Traffic control.

1. INTRODUCTION

Traffic congestion is an over-growing problem across world as increasing rate of population, automobiles usage which is proportional to it will also increases without any road infrastructure development. Due to this there will be a chance of high accumulation of vehicles at every traffic junction and during rush-hours it results in high congestion compared to normal times. Because of these situations which creates complexities for flow of emergency vehicles in busy-hours and it raise to putting person who are having need of emergency vehicle into critical stage. So, to erase this issue a research on different technologies are done and explored in order to monitor emergency vehicle and control traffic flow introducing green corridor technique. The green corridor technique can be implemented with many techniques like Radar technology, Image Processing technique and modules like GSM, GPS. As these technologies will have high maintenance and installation complexities etc. So, in this paper we introduced a model for implementing green corridor using Radio Frequency Technology. This technology is achieved by communication through RF modules are RF Transmitter attached to emergency vehicle and RF Receiver will be installed nearer to the signalling system.

1.1 Problem Statement

In today's real world even in increase of vehicles growth, traffic signals are programmed and still running on fixed timers which will does not vary based on the volume of vehicle accumulation at junction. Due to this scenario there will be a chance of increased waiting time. As no provisions are available with present traffic monitoring system for getting any information about vehicles. Because of this it will become very difficult to track vehicle and to control signals. So, it creates complexities in emergency situations to minimize delay time of emergency vehicle and may put life's at risk.

2. RELATED WORK

Since inefficiency of effective traffic system results in huge economic loss. It will also return loss of human lives. So, a great work has been done to deal with these problems.

➢ According to IEEE paper published on Intelligent Traffic Control System using IR sensors(2009)[1] determines vehicle monitoring and density of vehicles on road. The volume of vehicles will be calculated based on data received from IR sensors and sets the operating time of traffic lights.

➢ A paper is published by Dr. r. s. Deshpande, J. G. Rana[2] on Traffic Control System Based on Embedded Technology(2012). This paper uses sensor nodes and networks in addition to embedded technology to manage traffic congestion through communication between every junction and controls congestion based on information received from other previous junctions.

➢ According to proposed method of [3]Chakkaphong Suthaputchakun, Zhili Sun and Mehrdad Dianati the system will display status of traffic lights in advance to all emergency vehicles. So that driver of vehicle can move down the junction according to the received status. But there may be a chance of occurrence overspeed concept results in accidents.

➢ Rajeshwari Sundar, Santhoshs hebbar, and Varaprasad golla proposed [4]Traffic Control System for Emergency Vehicle Clearance and Stolen Vehicle Detection. This system uses RFID readers and RFID tags(2015).

➢ Prajakta Waghere, Priyanka Nalawade, Nisha Vanare, Prajakta Kalbhor, Prof.A.J.Jadhav published IJARSE paper on Dynamic Traffic Control System using RFID technology(2017)[5]. It uses IR sensors, microcontroller for controlling traffic flow based on status of IR sensors. This paper deals with decision making algorithm(DMA).So system flow is designed based on this algorithm.Do not use abbreviations in the title or heads unless they are unavoidable.

3. PROPOSED MODEL

The main methodology of proposed model is to allow clear flow of vehicles for preventing emergency vehicles from traffic congestion during emergency situations. As the existing model is inefficient to solve congestion controlling for priority vehicle clearance. So, this paper illustrates "Intelligent Traffic Control System" using radio frequency wireless communication technology. The architecture of proposed system is as shown.
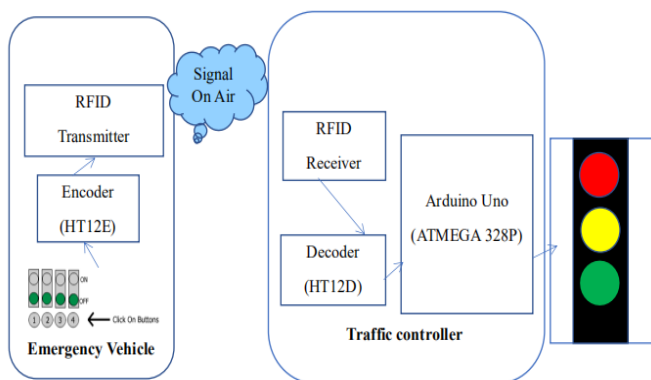

Figure.1 Block diagram of proposed system

This system primarily consists of Arduino uno(ATmega 328p) microcontroller, Encoder(HT12E), Decoder(HT12D), RF transmitter and RF receiver is mainly designed to work under two modes are normal mode and emergency mode.

3.1 Normal Mode

In normal mode whole working of system is based on operation of on-chip microcontroller which is programmed to control traffic signals with fixed predefined time intervals. So, based on predefined time intervals signals in different ways are getting altered at different interval of time. Similarly, every central traffic control system is programmed with different functions and methods according to the traffic congestion in particular way.
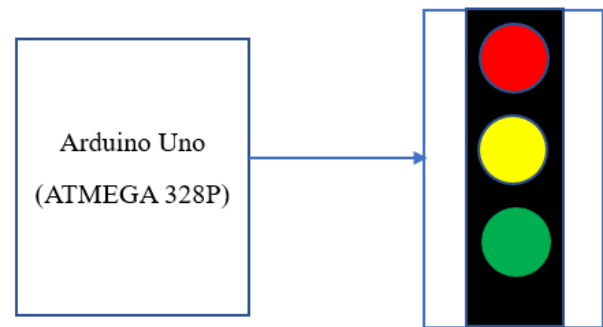

Figure.2 Normal mode of operation

3.2 Emergency Mode

In this system, emergency mode is activated by changing switch state to high on transmitter side. When a particular switch gets activated then a signal along with encoded data is transmitted through RF transmitter to the RF receiver installed at central traffic control system nearer to every traffic junctions. After data reception the microcontroller will control signal states for smooth flow of emergency vehicle. So in emergency mode traffic lights will be controlled by received data.
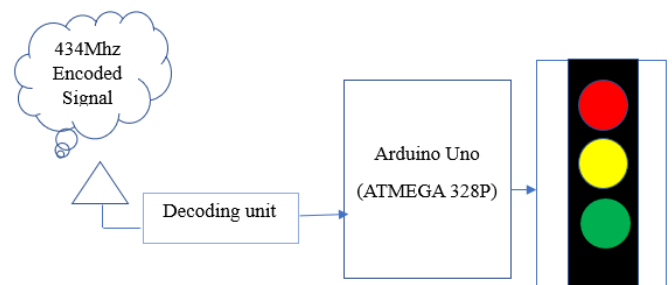

Figure.3 Emergency mode of operation

In emergency mode, the radio frequency signal is transmitted by activating switches. When the switches are activated a particular voltage of signal which is produced will be encoded (parallel data will be converted into serial data) along with some address bits which provides security to transmission data. Finally, this encoded data is given to data pin of RF transmitter to establish serial communication between transmitter and receiver. After establishment of connection a signal of frequency 434Mhz will transmit the encoded data to receiver which is connected to microcontroller through decoder which decodes the received data signal by frequently checking security bits of signal. If the received security bits are matched then valid transmission pin of decoder will get activated and decoded data is given to microcontroller. And the microcontroller will control system according to decoded signal. So, when an emergency mode is activated it gives a Green signal to that particular direction and sets Red signals to all other roads or directions approaching the Junction.

4. SYSTEM ARCHITECTURE

System architecture describes the solution with absolute planning for a problem. After proposing a system with specifications, designers will employ for designing a solution which includes both hardware and software tools for implementation. System architecture will describe the algorithm and flowchart implementation of system as follows.

Flow diagram sequences are described

1. Power up the circuit.
2. Initialising and assigning constant values to interrupt variables.
3. Checking for interrupt signals.
4. If interrupt is found, then it will check for values of interrupt variables.
5. After evaluation respective line will be activated based on received interrupts.
6. If interrupt is not found then every line will be activated after checking for interrupt signals in different time intervals.
7. Repeat the above process from step.3 to step.6.

Figure 4. Flow chart of system

5. RESULT & DISCUSSION

Implementation and working of proposed "Intelligent Traffic Control System for Emergency Vehicle Using RF Technology" is analysed and evaluated with on-board display. In the proposed system, the traffic light control is controlled by the ATmega328P microcontroller. The RF system identifies the emergency vehicles and sends message to the microcontroller. Upon receiving the message, the microcontroller operates the green light for the emergency vehicle. The receiving of message in the microcontroller and operation of different working modes are observed and are as follows:
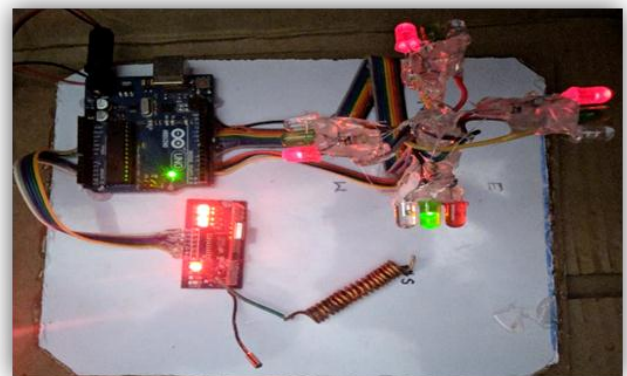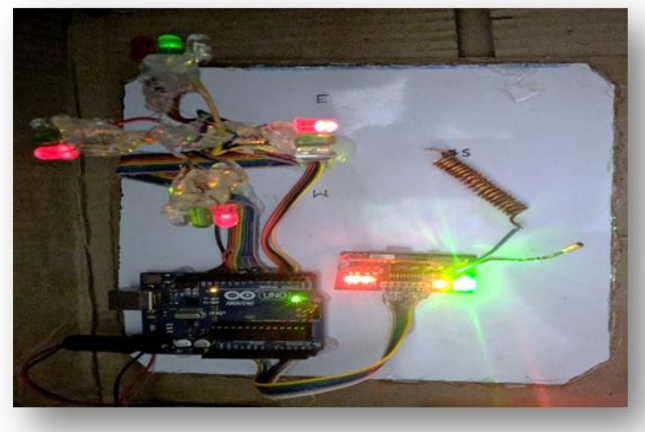

Figure 5. Normal traffic lights
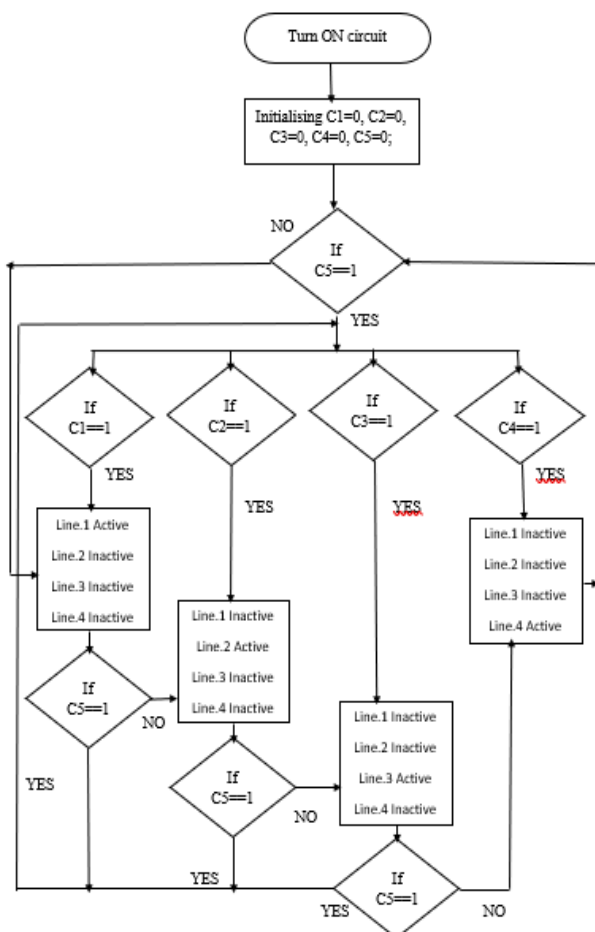

Figure 6. Emergency mode on east

6. FUTURE ENHANCEMENT

Further enhancements can be done to the prototype by testing it with longer range RFID modules. At present, we have implemented system by considering one road of the traffic junction. It can be improved by stretching to all the roads in a multi-road junction.

7. CONCLUSION

The paper has the project "Intelligent Traffic Control System for Emergency Vehicle Using RF Technology" has been successfully designed and tested. In this implementation we have used Radio Frequency Technology. It is developed with integration of all hardware components. Existence of every module has been examined out and placed carefully thus contributing to the best working of the unit. Secondly, with the benefit of expanding technology using highly advanced IC's the project has been successfully implemented.

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