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A NOVEL TRAFFIC SIGNALING SYSTEM FOR EMERGENCY VEHICLES

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ABSTRACT

Traffic congestion crisis is an observable fact which contributes large impact to the transport system in India. This leads several troubles in particular when there are emergency vehicles like police vehicles, ambulances and fire engines at the junctions. To address this crisis, we presented Traffic Signaling System (TSS) for Emergency Vehicles. This system effectively employs the Radio Frequency (RF) technology and Arduino UNO to clear traffic and provide path for emergency vehicle to arrive the destination on time. The TSS is deployed by placing transmitter module in the emergency vehicle and receiver modules are placed at the junction. Emergency vehicle have a switch, by pressing this switch transmitter module sends the signal to the receiver module. Upon receiving signal from emergency vehicle, the Arduino clears the corresponding path by activating green signal.

KEYWORDS

Microcontroller, Arduino Uno, RF transmitter, RF receiver.

1. INTRODUCTION

Several countries in the world are facing the crisis at traffic junctions that leads collisions between public motor vehicles and emergency vehicles. The TSS system in India explicitly has not been set with proper scheme when emergency case occurs at the traffic junctions. Due traffic congestion at the junctions, the emergency vehicles like police vehicles, ambulances and fire engines are difficult to arrive at the destination in time. In addition, the circumstances are getting inferior when emergency vehicles have to stop for other vehicles to provide path at junctions using signals. This leads to delay of time and possibly will have an effect on the emergency cases. Above all crisis's faced by emergency vehicles is prevented by employing traffic signaling system based on RF Communication between emergency vehicle and the traffic junction.

2. RELATED WORK

The RF signal originally is AC signal that is produced from the transmitter [1]. This AC signal is transmitted through a coaxial cable and diverged out of an antenna facet in the form of radio waves. The radio waves around the antenna mainly change in current flow in the transmitting antenna. This radio wave strikes the receiving antenna, which will change in current. The basic Radio Frequency communication system is shown in figure 2.1.

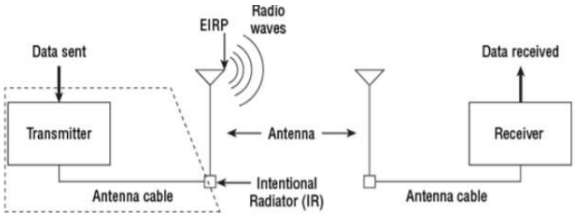

Fig. 2.1 RF Communication

In [2-4] authors presented traffic light system (TLS) employed for emergency vehicles. The emergency vehicle is equipped with sensors, which send to the receiver at the junction. Upon reception of this signal, the processing unit at junction analyze the congestion and diverts to other directions and provide the path for the emergency vehicle. By providing separate path emergency vehicle will reach the destination on time.

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In [5, 6] authors presented driver alerting system for detection of emergency vehicle by alarm. Non-emergency vehicle is mounted with sound signal detection and it display remotely located emergency vehicle. A switch is employed to manage the working of the sound source along with a siren.

In [7] authors described convenient RF communication between emergency vehicles and the traffic junctions. The project employed the RF band of 434 MHz in contrast to the range from 3 kHz to 300 GHz of band. In [8] authors introduced dynamic adaptive a sensor based pedestrian crossing system at traffic junctions.

In [9] the authors introduced power network monitoring using embedded Web server. The system employs LPC2148 and embedded TCP/IP Rabbit Core Module 5170. In [10] authors presented health should be given more importance in person's life. Health monitoring systems has been developed in these few years that can increase in providing better health.

3. PROPOSED SYSTEM

The proposed TSS architecture is shown in figure 3.1.This system consists of transmitter (Tx) and receiver (Rx) section. The Tx section consists of Arduino Uno and RF transmitter module. The receiver section contains Arduino Uno, RF receiver and LEDs. The Tx and Rx communicating wirelessly using RF technology.

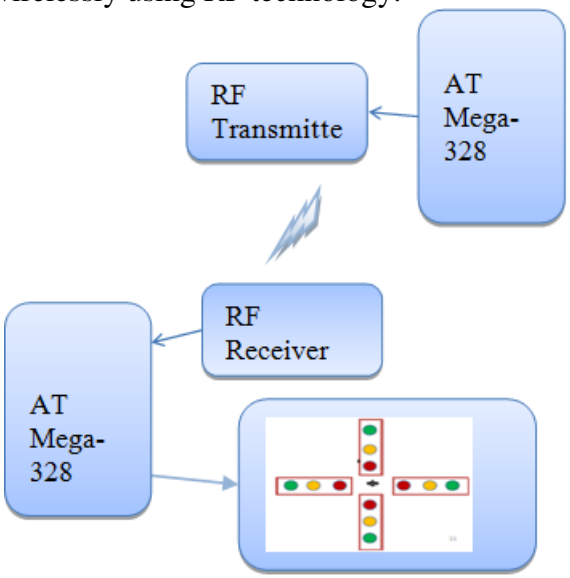

Fig.3.1 Block Diagram of proposed system.

Ardunio Uno:

The arduino Uno is employed at the Tx and Rx modules in the TSS, which is the processing system. This is low cost, efficient and user friendly board. The pin description is shown in figure 3.2 and features are given in Table 3.1

Microcontroller	ATmega328
Operating voltage	5V
Digital I/O pins	14(of which 6 provides PWM outputs)
Analog input pins	6(A0-A5)
DC current	40mA
Flash memory	32KB
SRAM	2KB
EEPROM	1KB
Clock speed	16MHz

Table 3.1 Features of Arduino Uno

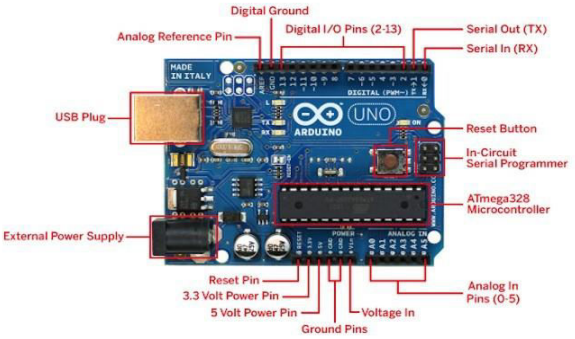

Fig.3.2 Arduino Uno pin description

RF Txr and Rxmodules:

The RF Tx module is a tiny Printed Circuit Board sub-assembly able to send radio waves and modulate the waves to carry the data. They are generally connected to the processing device for transmitting data. The system is working within a frequency band from 30 kHz to 300 GHz. This RF module consists of an RF Tx and Rx. The Tx/Rx pair operates with 434 MHz frequency. The RF Tx send serial data wirelessly via antenna connected at pin 4.

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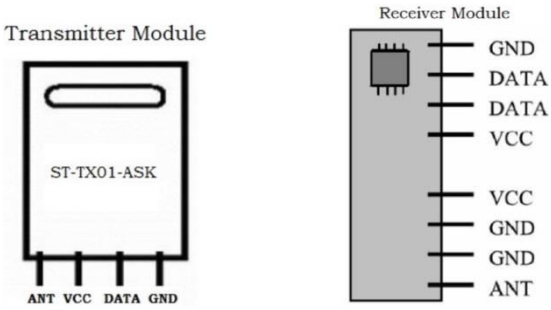

Fig.3.3 RF Transmitter and receiver modules

The transmission data rate supported by this module is in the range of 1 to10Kbps. The RF Rx module is also operating with same frequency and data rate as that of the transmitter module. The RF TX/RX modules are shown in figure 3.3 and pin description for Tx and Rx modules are given in table 3.2 and 3.3 respectively.

Pin No.	Name	Function
1	Ground	Ground(0V)
2	DATA	Serial data input
3	V_{CC}	Supply voltage(5V)
4	ANT	Antenna output

Table 3.2 RF Transmitter Pin Functions

Pin No.	Name	Function
1	Ground	Ground(0V)
2	DATA	Serial data input
3	NC	Linear output pin; not connected
4	V_{CC}	Supply voltage(5V)
5	V_{CC}	Supply voltage(5V)
6	Ground	Ground(0V)
7	Ground	Ground(0V)
8	ANT	Antenna input

Table 3.3 RF Receiver Pin Functions

Communication among RF Transmitter and Receiver modules:

The RF Tx/Rx modules are internally uses a pair of encoder/decoder. The main purpose of encoder is to encode parallel data for transmission end where as decoder is used to decode the data at receiver end. HT640-HT648 and HT12E-HT12D are generally used encoder/decoder pair available in the form of Integrated Circuits.

The input signals, at the transmitter side (shown in figure 3.4), are taken via 4 switches while the outputs are monitored on a of 4 LEDs (as shown in figure 3.5) corresponding to each input switch. The circuit will be used for planning remote appliance system. The outputs from the receiver will drive corresponding relays connected to any appliance. The communication among the transmitter and receiver modules is shown in figure 3.6.

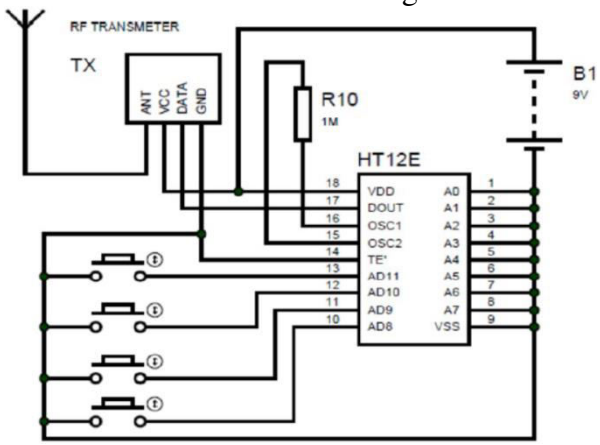

Fig.3.4 RF Transmitter internal schematic

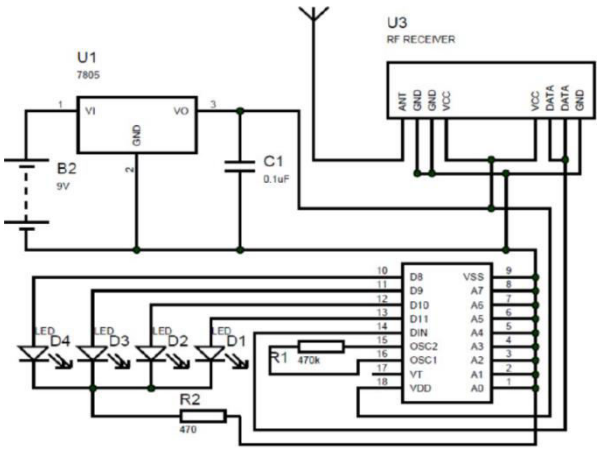

Fig.3.4 RF Receiver internal schematic

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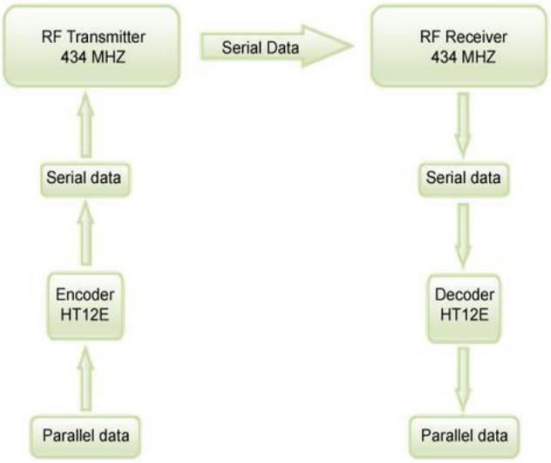

Fig.3.5 Communication among RF Tx/RX modules

4. RESULTS

The Traffic Signaling System for Emergency Vehicles is shown in figure 8. This system effectively employs the RF wireless technology and Arduino UNO to provide to clear flow of traffic for emergency vehicles like ambulances, police and fire engines to arrive at the destination in time. This system is implemented by placing transmitter module in the emergency vehicle and receiver modules are placed at the junction. Emergency vehicle have a switch, by pressing this switch transmitter module sends the signal to the receiver module. Upon receiving signal from emergency vehicle, the Arduino clears the corresponding path by activating green signal.

Fig.4.1 TSS for Emergency Vehicles

5. CONCLUSION

We presented traffic light system (TLS) employed for emergency vehicles. This system effectively employs the Radio Frequency (RF) technology and Arduino UNO to clear flow of traffic for emergency vehicle to reach the destination on time. This is implemented by placing transmitter module in the emergency vehicle and receiver modules are placed at the junction. Emergency vehicle have a switch, by pressing this switch transmitter module sends the signal to the receiver module. Upon receiving signal from emergency vehicle, the Arduino clears the corresponding path by activating green signal. This system saves a lot of time at signals, solve traffic issues. The proposed system is Reliable and is able to detect the primary appearances of emergency vehicles.

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