Life Saving Lane clearance Mechanism for Speedy Transport of Ambulance

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***Abstract* - This paper is about providing a traffic free path for an emergency vehicle, such as an ambulance, so that it can reach its destination much quicker thereby minimizing its travel time. This is done by fixing a transmitter in the ambulance and a corresponding receiver in the vehicle, such as a car, which is going some distance ahead the ambulance that causes traffic. The receiver unit will be powered up immediately once the engine of the car is ignited and the unit will start to sense for that particular radio wave. But the transmitter in the ambulance should be turned ON manually so that it starts radiating only when the ambulance is ready to serve a patient. So, even before both the vehicles come close to each other, the car is intimated about the arrival of the ambulance. This will make the car move aside from its path making way for the ambulance to move without any traffic in its way. In the car, when no music system is turned on, just an alarm is activated when the receiver senses the signal from the transmitter. Suppose, at times, if the car has a music system turned on, then our receiver will turn off that system and turn on an alarm once if the receiver picks up the signal from transmitter. In both the cases, after the alarm goes on, it can be turned off manually by using a button provided with the unit. Once the alarm is turned off, the music system will be resumed from the point where it was interrupted. Therefore, this proposed method saves time taken by the ambulance to reach the destination and also saving patient's golden time.**

INTRODUCTION

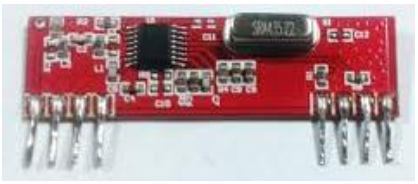
India is the second most populous country in the World and is a fast growing economy. It is seeing terrible road congestion problems in its cities as well as Highways (state highways). Infrastructure growth is slow as compared to the growth in number of vehicles. As per National Highways Authority of India (NHAI) under the Ministry of Road Transport and Highways, there are just 16,553 Km of four, six and eight lane roads which only contribute to 23% of total length of highways in India. But 56% of highways in India is double lane road where traffic congestion is increasing day by day. The following table shows the length (in Km) of various highways in India.

Lanes	Length (km)	Percentage
Single Lane / Intermediate lane	18,350	26%
Double lane	36031	51%
Four Lane/Six lane/Eight Lane	16,553	23%
Total	70,934	100%

For an ambulance reaching spot, either the accident site or nearby hospital, with this traffic congestion will be very difficult and time consuming too. In a life-threatening emergency, every second counts. The speed that treatment is received can literally make the difference between life and death. Long waits might be more likely in rural parts of the country since the ambulance has to move towards city in some cases using highways. Emergency medics say a delay of a quarter hour may not seem much for commuting in the city or on highways, but becomes a matter of survival when a patient is fighting for life. "Like the golden hour during emergency, minutes are platinum after a road accident. In many cases, medical attention or first aid is immediately warranted. However, in any Indian city, it is difficult for an ambulance to reach the patient and then bring him/her to the hospital. If we can even shave off five minutes from the time it takes an ambulance to operate, it would make a big difference," said Imron Subhan, Head, and Emergency Department at Apollo Health City. If there is no traffic disturbance on highways and if time is saved, the scenario will be great for both patients and as well as for the ambulance drivers. So this paper focuses on dealing with a technique that will overcome the traffic congestion, especially faced by an emergency vehicle like an ambulance, without providing additional investment in our existing double lane road system.

Proposed methodology

The design of the proposed prototype can be broadly classified into two sections, that is, the transmitter and receiver. These two sections communicate over wireless medium. The transmitter section will be placed in an ambulance and the receiver section in a car. For the transmitter section, ASK RF wireless transmitter is used and similarly for the receiver, ASK RF wireless receiver is used. The images of the transmitter and receiver which are used in the prototype is shown below.



ASK RF wireless receiver

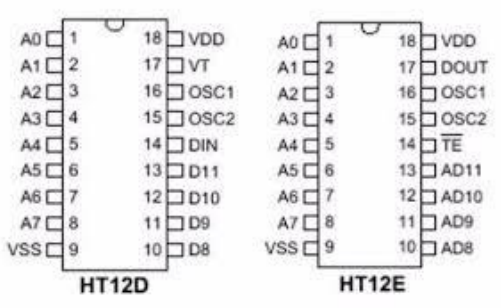
Transmitter

The transmitter and receiver is meant to operate in an unlicensed frequency range of 433MHz. But in reality, a proper licensed frequency band can be utilized inimitably for this purpose. The pin description and the specification for the transmitter and receiver is shown in the table below.

Technical parameters for transmitter	
Product model	HT12E
Transmission range	60m
Operating voltage	3.3V – 5V
Operating mode	Amplitude modulation
Transfer rate	4 kilo byte per second
Transmitting power	10mW
Transmitting frequency	433MHz
Dimensions	19*19mm
Antenna	30cm wire antenna
Pinout from left to right	DATA, VCC, GND, ATN

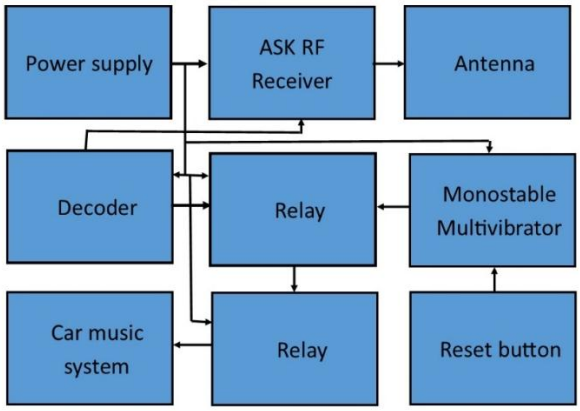
Technical parameters for receiver	
Product model	HT12D
Operating voltage	3.3V – 5V
Operating mode	Amplitude modulation
Quiescent current	2.5mA
Receiver sensitivity	-105DB
Receiving frequency	433.92MHz
Dimensions	30*14*7mm
Antenna	7.5cm wire antenna
Pinout from left to right	VCC, DATA1, DATA2, GND,ATN

The transmitter radiates encoded signals by using HT12E encoder IC. Similarly, the receiver receives the encoded signal and decodes it, thereby obtaining the data that was sent. For decoding purpose, HT12D decoder IC is utilized. Both the integrated chips are eighteen pin dual inline packaged chips. The encoder as well as decoder has eight bit address lines and four bit data lines. These integrated chips can be easily combined with the ASK RF transmitter and receiver. Since the transmitter radiates encoded data, the content on air is secured. So, only the particular receiver in the car which is designed to receive this encoded data will alone receive the signal. Therefore unwanted reception can be avoided. This becomes an added advantage in using these encoders and decoders for wireless transmission and reception.

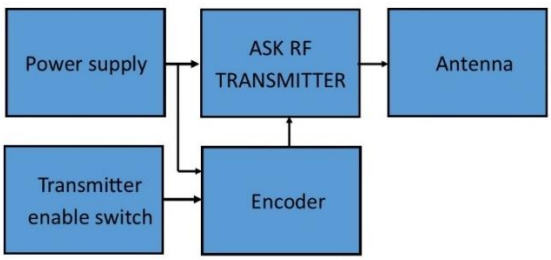


At the receiver side, a buzzer and a LED operates as output peripherals that are meant to provide an indication about the presence of an ambulance some distance behind. When these peripherals are active, a relay is utilized to turn off the music system only if it was already turned on. If the indication (the buzzer and LED) has to be turned off and if the music system of the car has to be activated, then for this purpose a unique button is provided which once pressed, things will be changed as stated. But components that we use at the transmitter side are simple. It consists only the ASK RF wireless transmitter along with the encoder. Once the ambulance is ready to serve a patient the driver can turn on this transmitter and it then starts radiating. Therefore when the ambulance is standby, the device will be turned off so unnecessary transmission is avoided. The block diagram of the transmitter as well as the receiver is shown below.

Block diagram of receiver

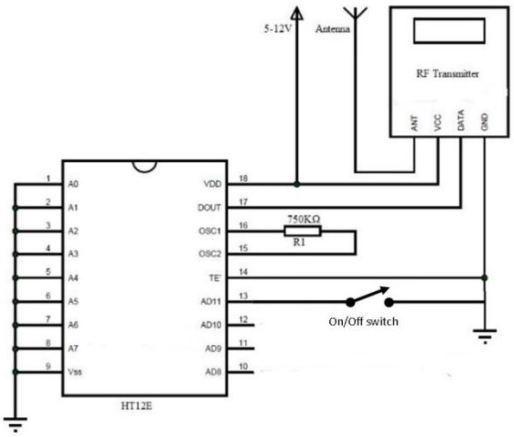


Block diagram of transmitter

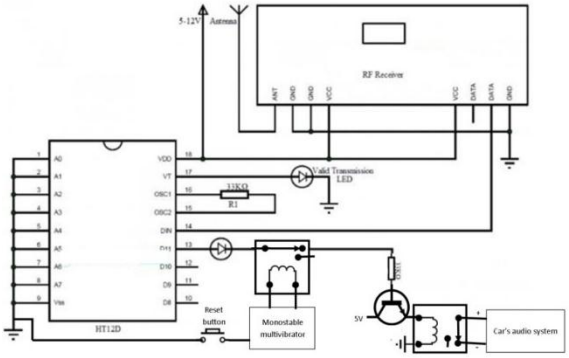


The image below shows the schematic sketch of the receiver and the transmitter which is designed based on the respective block diagram.

Transmitter schematic

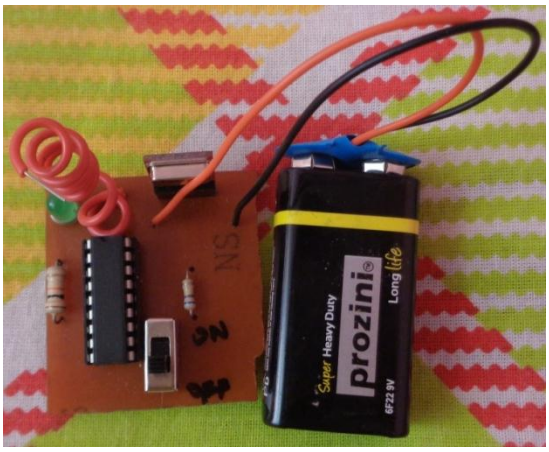


Receiver schematic

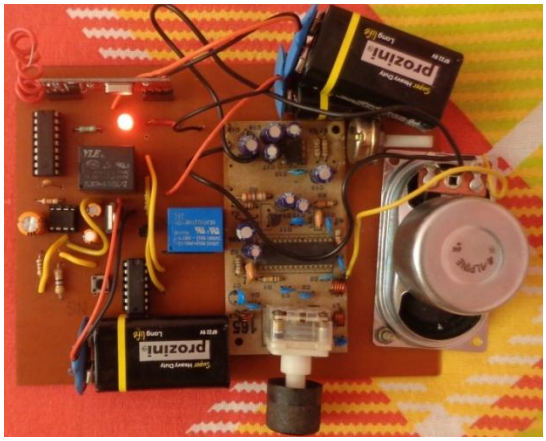


The monostable multivibrator mentioned in the receiver unit is designed using a 555 timer IC which is meant to operate such that once the negative trigger is made on (that is, the reset button), output of the monostable multivibrator goes high for 10 seconds (for prototype use alone, in reality this time can be increased). Therefore, the car music system is activated. The antenna that the transmitter uses to radiate the signal is a wire antenna (in our prototype) that radiates electromagnetic waves omnidirectionally, that is, in all directions. But in reality, this omnidirectional feature of the transmitter won't be suitable. Why because, if the waves are radiated omnidirectionally, even though the car which gave way to the ambulance and if the ambulance asses ahead the car, it (the car) will get unwanted signals from the transmitter again and again causing discomfort to the car driver. So to avoid such a discomfort, the wire antenna used here in the prototype can be replaced with a highly directive antenna such as yagi-uda antenna. This antenna is selected because it has good directivity (narrow beamwidth), acceptable front to back ratio and also it is easy to design. Therefore, the traffic that the ambulance faces alone gets the information about the arrival of the ambulance where the traffic behind the ambulance will not be intimated unwantedly.

Developed prototype:
Transmitter:



Receiver:



CONCLUSION

There are some techniques that focuses to avoid the traffic that occur within the city. But this system will definitely help the ambulance to avoid the traffic that are indirectly present in the highways. The design and implementation of this technique is directly targeted for traffic management so that emergency vehicle on road get clear way to reach their destination in minimum time and without any unwanted interruption. It is made sure that the golden time for the patient struggling for life is saved by minimizing the travel time of the ambulance.

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