Automatic Speed Breaker Flattening System For Ambulance

S. Chandhini, Dr. D.Veera Vanitha, K. Bharathi Nandha, M. Pooja Dharshini

***Abstract*— in our day to day life we see many sudden emergency cases like accidents and medical issues. In such emergency situations, to save the human's life there is a need for an ambulance that reaches the hospital in time. But speed breakers are the major obstacles on the road that the ambulance is in need to deal with because it doesn't provide a free flow path for any vehicles and also increases the time delay in reaching the hospital. This paper is based on the concept automatic speed breaker flattening system which includes RF module and motors.**

***Index Terms*— Transportation, speed breaker, Ambulance**

I. INTRODUCTION

In the rapidly changing world, speed has become an important factor in human life. In this fast world for safety purposes and to prevent accidents taking place on the road, there is a concrete speed breaker placed on roads to limit the speed of vehicles. They are always found firm on the road. These types of speed breakers are laid at service road junctions and residential roads [1]. As per the IRC-99 guidelines, speed breaker should have a radius of 17 meters, width of 3.7 meters and a height of 0.1 meters. The speed breakers can reduce the speed of the vehicle up to 25km/h. The distance between one hump to the other can vary from 100 to 120 meters. These speed breakers are very useful on road, but at the same time, they are the major obstacles for emergency vehicles like an ambulance. The patients who are met with an accident or any sudden medical issues are taken to hospitals using an ambulance. In such a hectic situation, the time is an important factor to be considered, because the ambulance needs to reach the hospital in time to save a patient. As mention above, the speed breaker reduces the speed of every vehicle to a certain range which causes the time delay.

In the first case, taking a patient's life into consideration, the speed breakers should be removed in order to reduce the time delay. And in the second case, for the concern of other vehicles, the speed breakers cannot be removed because it is an important parameter, which is helpful in avoiding accidents due to excess speed of the vehicles. Taking these two cases into considerations, a concept is proposed with the idea of an automatic speed breaker flattening system. This artificial system replaces the firm ones and appears on the road with the exact measurements provided by the IRC-99 guidelines. Only when it detects the ambulance it disappears from the road and provides a free flow path. After the ambulance crosses, the speed breaker again appears on the road. Through this system, both cases can be balanced. Though fixing such a system on-road may be a difficult process, by giving priority to emergency vehicles, the roads can be provided with an automatic speed breaker flattening system. So that the ambulance need not slow down and it can reach its destination on time [2,3]. In this paper, the ways to implement such a system using an RF module and motors are explained.

II. LITERATURE SURVEY

In this survey, various work done related to speed breakers are taken into consideration. And the papers with the most important work which is helpful in developing the proposed system are mentioned below

Mohit Jain et al., [4] proposed a system that uses a smartphone-based application to alert the driver in advance when the vehicle is approaching a speed breaker. An application is built to constantly monitor the smartphone accelerometer and detects the unknown speed breakers. And it even alerts the driver about the newly placed speed breakers. This system is used to reduce accidents at night.

Satyanarayana et al., [5] developed a system to calculate the speed of the vehicle at three various locations based on the place where the vehicle speed must be controlled and if the speed is greater than the designated speed in that road then it will automatically open the speed breaker to control the speed of the vehicle. If the speed is less or equal, then the vehicle will be passed without any disturbance. In this type, the driver will be intimated through an alert message. Again, the speed is calculated at a certain distance and informed to the driver.

Ajay et al., [6] designed a system to reduce the speed of the vehicle and to maintain the performance of the vehicle. It consists of half flat and half semicircle shaped long metallic pipe, two magnetic sensors to adjust the close and open point of the speed breaker. In this system, a real time clock is set. The hump remains on road only for the time and duration set manually. Other than the set time, the hump will be flat. These systems are used near school buildings.

Manuscript received May 31, 2020

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Chethana Patil et al., [7] designed a smart speed breaker for emergency vehicles to move faster. In this system vehicle and the hump communicated through RF signal and the signal is processed in such a way that, it should allow the hump to be flat when it detects the signal. In this system, RFID is used.
Suresh et al., [8] proposed a speed breaker system that undergoes a rotational process and the hump becomes flat. The relay ON and OFF is programmed in the Arduino, in order to control the direction of motor rotation. The proximity sensor senses the position of the speed breaker and feeds it to the Arduino. Once the position is sensed, the Arduino decides the next action to continue the process.

From all the survey, it is found that the speed breaker system gives warning to the driver about the hump, the vehicles speed, to avoid accidents on road. And few speed breakers comes to road when there is demand. By inferred ideas from the survey, the system is developed to help ambulance reach hospital in time.

III. PROPOSED METHOD

A. Block Diagram

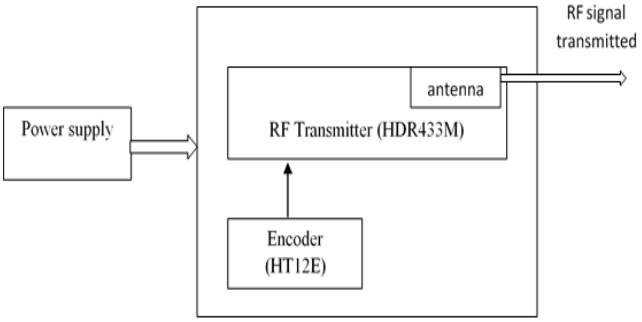

Fig.1: Transmitter block

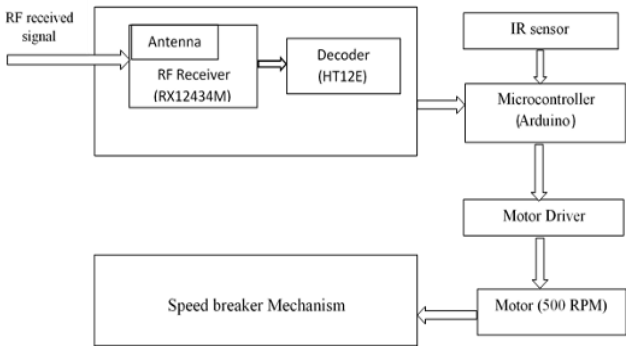

Fig.2: Receiver block

B. Working:

The Transmitter block shown in Fig.1, consists of a power supply, RF transmitter, and an encoder IC. This block is placed in the ambulance. The receiver block shown in Fig.2, consists of an RF receiver, Decoder IC, microcontroller, motor driver, motor and the speed breaker mechanism. This block is placed on the road. Whenever RF signal with the encoded data is transmitted through the RF transmitter from the ambulance, the RF receiver receives the signal. Then the received signal is then decoded and is given to the controller, then controller rotates the motor through the motor driver. The motor is connected to the speed breaker of a receiving system. When signal is sent by controller to motor driver, then driver drives the motor according to the signal sent by the controller, the motor starts rotating and the speed breaker will go down to the level of road surface. Hence the speed breaker will appear flat and the ambulance moves smoothly without any disturbance. Once the ambulance crosses, the motor again rotates and the speed breaker again comes back on the road and does its operation.

Few pin functions and basic connections in the transmitter and the receiver circuit, to be given in order to start the process is stated below.

C. Transmitter part:

The data in this RF transmitter is transmitted as 4-bit data. The data to be transferred is wired with the help of switches at data pins D0 to D3 of the encoder IC. The resistors are used at data pins. All address pins are grounded so that the transmitter is allotted with the address of 0x00. The transmission enable pin of the IC is grounded to enable transmission with an active LOW signal. To set the oscillator, a resistor of high resistance up to few MHz can be connected between oscillator pins of the encoder IC. The serialized data is passed on from the encoder IC to the RF transmitter. A modulated carrier wave is the output of the RF transmitter and transmitted through the antenna.

D. Receiver part:

At the receiver end, the modulated carrier wave is detected by the receiver antenna and passed on to the antenna pin of the RF receiver. The RF receiver itself demodulates the signal using its inbuilt demodulator. The demodulated signal from the serial output data pin of the RF receiver is sent to the serial data input pin of decoder IC for converting to parallel data from the serial form. A resistor is connected between oscillator pins of the decoder IC to match the oscillator settings in the encoder IC. The address at the decoder IC is hard wired in order to match it with the address at encoder IC and to enable the pairing between transmitter and receiver and all the address pins are grounded to match the address at the transmitter. The received data is fetched at data address pin of decoder IC which are designated as D0 to D3 at the board respectively. Once the signal is matched, it is then passed to the microcontroller (Arduino) where the programmed is burned into the chip. According to the program, the signal is sent to the driver which drives the motor and also controls the speed of the motor. The motor starts rotating and the speed breaker goes down the ground and the hump appears to be flat. After a certain period when the signal goes out of range the hump comes to its original position.

IV. RESULT AND DISCUSSION

The prototype is developed based on the block diagram and it is shown below.

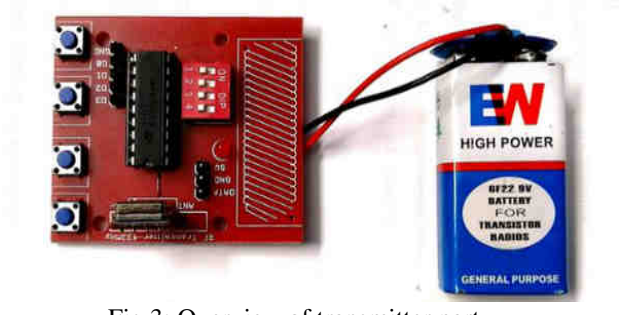

Fig.3: Overview of transmitter part

From Fig.3 it is inferred that the transmitter part has encoder IC, RF transmitter and switches. It is connected with the power supply. The RF signal is transmitted from the RF transmitter. The transmitter is kept in logic high. The communication takes place only when the RF signal comes into the range of 150m radius.

The overall setup on the receiver part is shown in Fig.4. It shows connections of components like RF receiver, arduino, motor, IR sensor and the speed breaker mechanism made of metal.

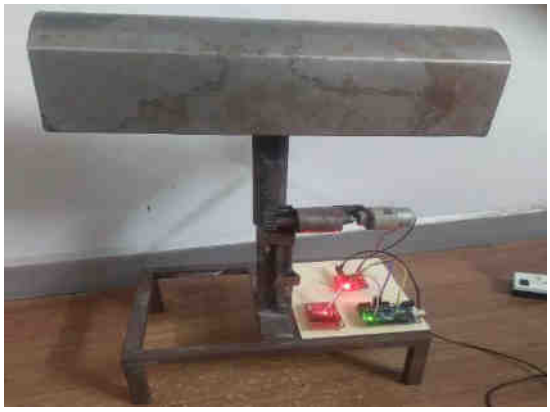

Fig.4: Overall set up of the receiver part

When the signal is received from the RF receiver, the motor rotates and the speed breaker goes down below the ground where it appears to be flat. Once the signal goes out of range then the speed breaker turn up on the road.

CONCLUSION

Now the existing roads are of a concrete type. In the future, the modified existing roads can be used, which is an automatic process. By attaching the automatic system to the speed breaker that aim can be achieved. This system provides a break free path for emergency vehicles like ambulance and helps to reach the hospital in time.

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