Embedded based Smart Traffic Junction

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***Abstract*— Nowadays congestion in traffic is a serious issue. The traffic congestion is mainly due to the outdated traffic signal management system. Here, in this paper titled "Smart Traffic Junction" optimizes the traffic controlling scenario by various means. The signal which will be displayed over a traffic signal will be made available on/inside the vehicle. The speed control of the vehicle is automated, when it enters the traffic signal zone. The speed of the vehicle is made gradually zero when the traffic signal indicates from yellow to red and when traffic signal indicates green, the speed control will switches from automated mode to manual mode. Also, we have incorporated the horn deactivate system, this automatically enables and disables the horn system in the vehicle, when it approaches the no horn/hospital zones. The road which is heavily dense in traffic will be given high priority and released first thus saving the precious time of larger number of passengers. Thus system tries to reduce possibilities of traffic jams caused by traffic lights to a certain extent. The system is designed based on microcontroller. The microcontroller used in the system is PIC 16F877A. The system consists of IR sensors, Trans-receiver and RF module, which are mounted on the either sides of roads respectively. The IR sensor system gets activated whenever any vehicle passes on road. The microcontroller is programmed and interfaced with the IR sensors so that it can easily distinguish the traffic lanes on the basis of the density. Along with the RF modules the horn will be deactivate in the hospital or school zone.**

***Index Terms*— Radio Frequency Module (RF), Infrared sensor (IR), Light Emitting Diodes (LEDs), Programmable Interface Controller (PIC)**

I. INTRODUCTION

The ever-increasing population of motor vehicles in modern cities traffic congestion is recognized as one of the disaster [1]. Travelling to different places with in the city is becoming more cumbersome, people loose time and trade opportunities, delivery gets delayed, and thereby the costs goes on hiking which ultimately leads to imbalanced life[2]. To address these shortcoming our system identifies the priority during dense traffic and releasing them first, helps in preventing rash driving by automated speed control. Barricade obstructs the further flow of traffic in undesirable condition hence violation of traffic rule and traffic signals are avoided, and also status of traffic signal is displayed on/inside the vehicle.

II. METHODOLOGY

The microcontroller used in the system is PIC 16F877A along with RF module. The system consists of IR sensors Trans-receiver along with RF module which are mounted on the either sides of roads respectively. The IR sensor system gets activated whenever any vehicle passes on road. The microcontroller is programmed and interfaced with the IR sensors so that it can easily distinguish the traffic lanes on the basis of the density.

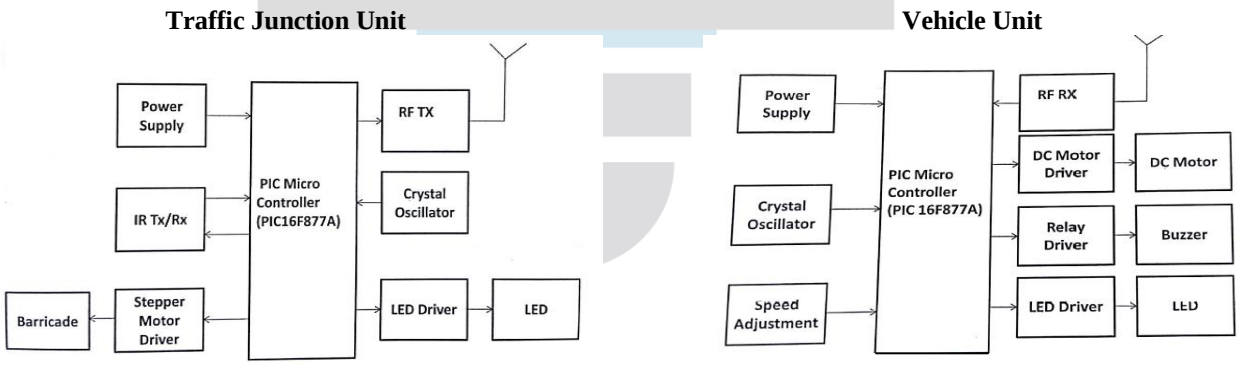

Fig 2.1 General Block diagram of smart traffic junction

It includes mainly following two units

a. Traffic junction unit
b. Vehicle unit

Here we have used RF Tx/Rx to control the speed of the vehicle automatically, and also to display the traffic signal status inside the vehicle. The block diagrams associated with traffic junction unit and vehicle unit is as shown in Fig 2.1. The traffic junction

module mainly consisting of the RF transmitter will transmit the RF signal towards the vehicle. There are 9 LEDs which are used to display the traffic signal at the junction. We have made a 3 road junction model, 3 LEDs are placed for each road. IR Transmitter and Receiver are used to detect the traffic density at the road and to release that road frequently. In the traffic junction the manual speed controls of the vehicles will be deactivated and the speed of the vehicle will be controlled automatically by the traffic junction unit. In the vehicle unit, the RF receiver will receive the RF signal from the RF transmitter and will display the signal on the vehicle through the LEDs. Speed adjust is used to manually increase or decrease the speed of the vehicle when it is out of traffic junction. DC motors are used to drive the wheels of the vehicle.

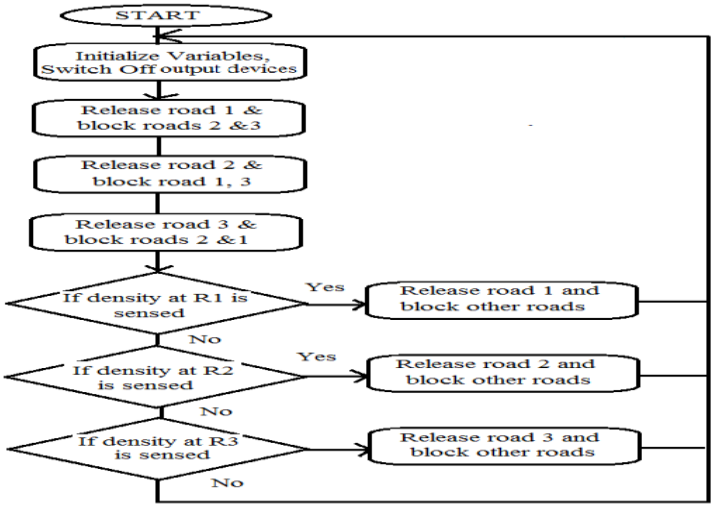

Fig 2.2 Flow diagram for Traffic Junction Unit

The step involved in our approach is given briefly in the flow chart Fig 2.2 and 2.3. Initially the variables, timers, counter and switch off the devices. Here we are using 3 roads with IR sensors. The IR sensor is employed to check the density of the roads. To block the road we use barricades. Here the sufficient delay for green signal and less delay for yellow signal is generated. The green signal will be visible for a 30 seconds and yellow signal will be visible for 5 seconds. Every time it finds out the density of the vehicle in each road. If the density of the vehicles in any road is high, it makes the first preference for that particular road and releases the vehicles immediately in that lane and blocks other roads. When a vehicle enters the hospital area, then the horn will be deactivated. For deactivation relay driver circuit is used.

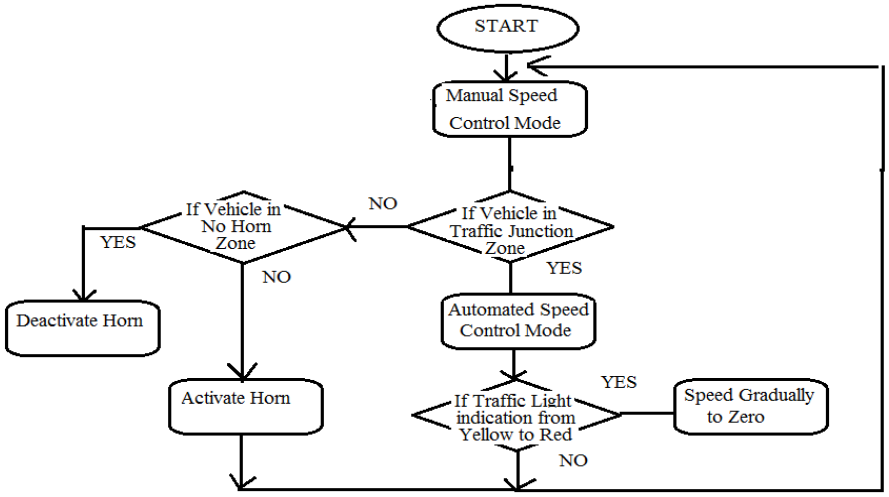

Fig 2.3 Flow diagram for vehicle unit

Initially all the variables, timers, counters initialized and reset the output devices. The speed of the vehicle will be controlled automatically; this is done by using PWM circuit. Traffic status is displayed on vehicle. When vehicle enters the hospital area horn will be deactivated. The communication between traffic junction and vehicle is done by using RF module. When a vehicle moves out off the junction, the speed of the vehicle will be controlled manually. To showcase manual control we are using potentiometer.

III. IMPLEMENTATION

The system has the following components interfaced. IR detector is used to detect the density. When the system is plugged to the power, the LED glows indicating working of the system. Reset the microcontroller once, so that it reset the system. The system consists of IR sensors Trans-receiver along with RF module, which are mounted on the either sides of roads respectively. The IR sensor system gets activated whenever any vehicle passes on road. The microcontroller is programmed and interfaced with the IR

sensors so that it can easily distinguish the traffic lanes on the basis of the density. In the traffic junction part, the RF transmitter will transmit the RF signal towards the vehicle.

1. The traffic displayed signal is made visible inside the vehicle.

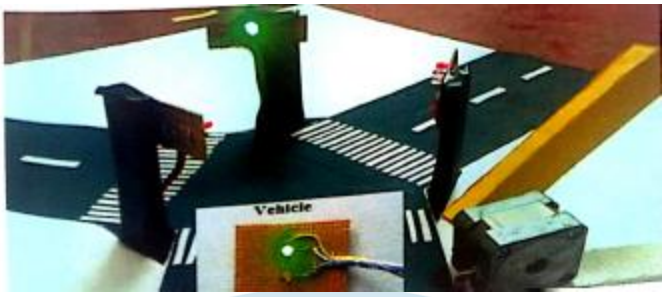

Fig 3.1 Signal display on the vehicle

2. The barricade is to prevent drivers from jumping the signal, when the signal on the traffic is turns to red, the barricade closes completely, so as to stop the driver from moving ahead thereby making way for the pedestrians to use in the zebra crossing.

Fig 3.2 Barricade status when signal is red

3. When the vehicle enters the junction it will be sensed by an IR sensor which will help detecting the traffic density.

Fig 3.3 Traffic density measurement

4. Speed adjustment is achieved with the help of potentiometer interfaced to the vehicle. This helps in adjust the speed range from maximum, medium and to minimum respectively. Once the vehicle enters the junction speed is controlled automatically. Outside the junction speed control is a manual procedure.

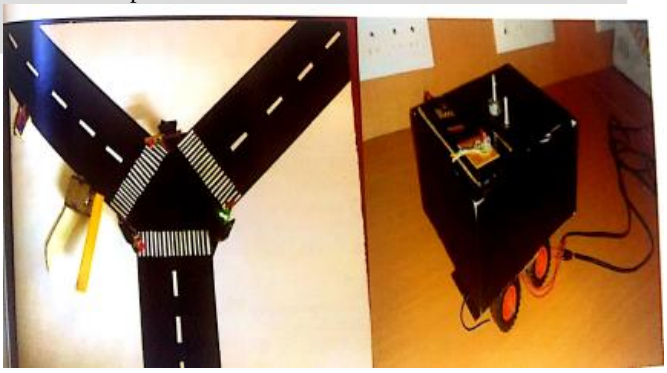

Fig 3.4 Smart Traffic junction and equipped vehicle unit

IV. CONCLUSIONS

Smart traffic junction includes barricade, start stop of vehicle, IR sensors for traffic density measurement and display of signal on the vehicle using LEDs through RF transmitter and receiver. The coding is done using PIC 2 kit software and embedded-c coding that will help us start and stop the DC motor of the vehicle and thereby control the speed of the vehicle. The enhanced infrastructure and transportation facilities will help in the development of a smart and safe traffic junction. It caters to the need of controlling the increasing Indian traffic and fulfills its objective of avoiding accidents.

V. ACKNOWLEDGMENT

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