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Situation Analysis & Speed Updating System (SASUS)

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ABSTRACT

This project is developed to manage traffic flow. This project is developed for new fast growing world. We provide some automation functionality to the vehicles. This system will use in future because day to day vehicle are increase, and road are getting unsafe. Some automotive companies are starting to develop new electric smart cars. Our system will mainly use in highways. SASUS is an algorithm base system in which the speed of particular area on highways will be changed according to analysis of vehicle flow. SASUS will provide the safety on highways. According to some survey most probably accident chances will occur through over-speeding. SASUS will provide the automation on it and it will take manually or automatically control of the speed. This system is decreased the accident due to over-speeding and maintain the traffic.

Keywords :- Arduino, Arduino IDE, RFID, RF Transceiver, Electronic Control Unit (ECU), Adaptive Cruse Control (ACC).

I. INTRODUCTION

Over-speeding is one of the main reasons behind the accidents occurring on the roads throughout the world. Due to over-speeding of vehicles on highways the probability of accidents be very high. In 2015 there were about five lakh road accidents in India, which took the life of about 1.5 lakh people. It also have injured about five lakh people. Since 2000, while the length of roads has increased by 39%, the number of motor vehicles have increased by 158%, which generates high concern for road safety. A total of 4,64,910 road accidents have been reported by States and Union Territories (UTs) in the year 2017, took the life of 1,47,913 lives and causing injuries to 4,70,975 persons.

Over-speeding and overtaking are two major causes for accidents taking place. There are many systems available for managing traffic but not many systems are developed for controlling and managing speed of vehicles. The world will be going into the electrical world and vehicles will also be electric and smart compared to their previous version. We can control the vehicles smartly, and make the best possible outcome through technology.

So, this research will help in controlling speed of cars and thereby managing traffic. It would help in maintaining the best possible traffic flow on the roads and increase the safety on the roads. Taking use of existing technologies to solve the problems of traffic management will be the outcome of this research.

II. EXISTING SYSTEM

Transport authorities of all over the world, has facing the problem of high accident rate on highways. On highways, they are installed sing board of speed limit. According to these sing boards, drivers have to control speed of their vehicles. If the average speed of the vehicle exceeds the speed limit, owner can be charged with speeding.

Fig. 1 Speed sign boards

Many ways to put speed sign boards on the road. Some speeds sign boards are digital or some are painted and radium stickers sign boards.

Fig. 2 Average speed Camera

These are the system in which over speed vehicle will detect automatically or manually, and send the memo to the owner of vehicle. In some areas, police vehicles check the speed of vehicle by speed gun and generate memo manually. Still, these laws and system is not that much affecting to reduce the accident rate all around the world. In so many countries, there are strict laws on ruse driving, and over speeding. In some countries, if you are break the rules more than three times, your license will be detained and you will not be able to drive forever and if you still drive then you will be punished according to law.

III. PROPOSED METHODOLOGY

Users (Drivers of an automobile like car) will receive the speed which has to be followed in the particular segment of road to securely drive in current traffic density and maintain the best possible traffic flow. The speed is generated and sent to vehicles by the SASUS system. This speed sent to the vehicle, if vehicle not maintained, can also be maintained by the cruise control the system of the vehicle if modification is done. By maintaining traffic in these chained segments the traffic is maintained throughout the road. These help in controlling over speeding and stops casualties on roads.

SASUS will work on three levels methodology:

A. Data Collection

Our system needs data collection for generating the traffic density, which is done by counting the number of vehicles entering and leaving a segment of road. So the number of vehicles in a segment is data for our system and counting the number of vehicles is collection of data.

For counting the number of vehicles we have used RF technology. We have proposed that RFid Readers are equipped on vehicle units and these vehicle units would pass by the RFid Writer which are set on our system at the ends of road segments. Whenever a vehicle enters a segment of road the counter for the number of vehicles in segment will get incremented and will get decremented when a vehicle will leave the segment of road.

B. Data Processing

In data processing we process the data of our system which is the count of vehicle units in a segment. This data is used for generating the traffic density in that particular segment.

Traffic density = Number of vehicles in a segment / Length of a segment.

This density is further used to generate the speed value for the vehicle units. This speed value is constant for a particular density as it is dependent on the length and wideness of a segment and changes with change in density of traffic.
These processes take place in the microcontroller which is set with the system at the ends of segments on the roads. This microcontroller takes the input as integer value which is the number of vehicle units and gives speed value as an output which is set for a particular density value.

C. Data Transmission

Data transmission in our system is done for transmitting speed value to vehicle units and transmitting speed value to preceding systems. The speed value transmitted to vehicle units will be displayed on screen in the car, which has to be maintained. The speed value transmitted to the preceding system is for maintaining traffic flow of that segment as per the situation of the succeeding segment.

The data transmission is done through the transmitters and receivers which are set on different units. For sending speed value to vehicle units, the transmitter is combined in a system at the ends of segments on road, and the receiver for the same is set on vehicle units. For sending speed value to the preceding system, the transmitter is combined in the system at the ends of segments on road and receiver are set on the preceding system. This sent value is an integer value as it represents the value of speed. 433 MHz transmitter and receiver are used which have a range of 100 meters which is enough for this system.

IV. HARDWARE EQUIPMENTS

A. Arduino UNO

Arduino UNO is used in Counting & processing unit, transmitting unit and car unit. Arduino UNO is programmable device in which we can upload programs and we can use it again for another purpose.

Fig. 3 Arduino UNO

B. RFID Rader and Writer module

RC522 - RFID Reader / Writer 13.56MHz is using in vehicle detection for counting and processing unit.

Fig. 4 RFID Module

C. NRF24L01 Transceiver module

The NRF24L01 module is used for transmit data or speed to the vehicle and also transmit speed to unit is ahead from it.

Fig. 5 NRF24L01 Transceiver Module

V. DIAGRAMATIC REPRESENTATION

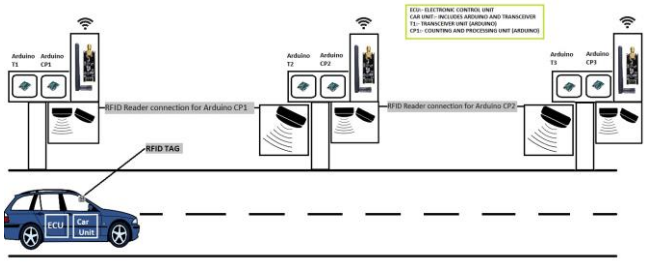

Fig. 6 SASUS over-view

We have to use three units at a point of counting, processing and transmitting.

A. Counting and Processing Unit

In this unit, we have to connect two RFID readers with Arduino UNO. Both RFID readers use for count the number of vehicles. One RFID reader is used enter the number of vehicles, and another RFID is used for checking the number of vehicles according to first RFID reader. If anyhow, density will greater than regular density than processing part will process and send the instruction to transmitting unit. In this unit, one RFID is installed at a starting point of segment means with unit number one and another RFID is installed at ending the point of the segment means unit number two. End of the one segment is starting point for another segment means except first, and last unit, each and every unit has two RFID readers.

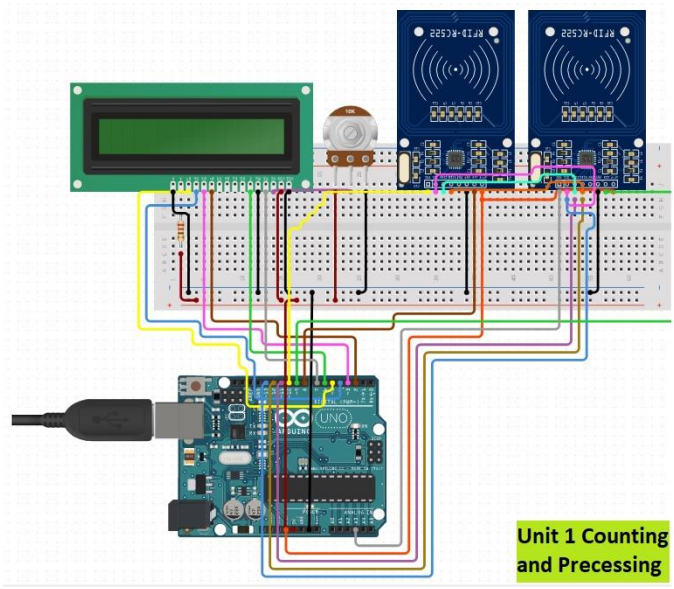

Fig. 6 Circuit of Counting and processing unit

B. Transmitting Unit

In this unit, we have to connect a transceiver unit with Arduino UNO. This unit will transmit data when counting and processing unit passes the instruction. This unit transmits data to previous unit if length of segment is smaller otherwise this

unit only transmit data to vehicles. Transmitting unit basically uses transceiver because the transceiver capable to transmit and receive multiple data to multiple units. If we use a high range transceiver then there is no need to connect two units via connecting wires. Transmitting unit is transmitting data to vehicle unit continually.

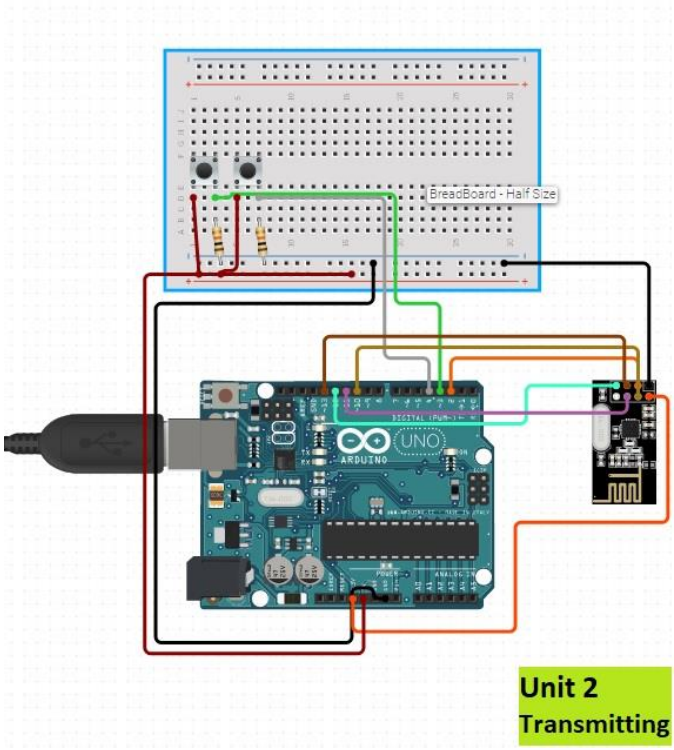

Fig. 7 Circuit of transmitting unit

C. Vehicle Unit

In this unit, a transceiver is connected with Arduino UNO and receiving speed from the transmitting unit. Vehicle unit is connected with Electronic Control Unit(ECU). ECU is manufacturing unit that is controlling the vehicle. ECU is controlling, vehicle speed using cruse control system, and maintain distance from the vehicle ahead. ECU controls Adaptive Cruse Control System (ACCS). ACCS is a smart way of driving for smart cars.

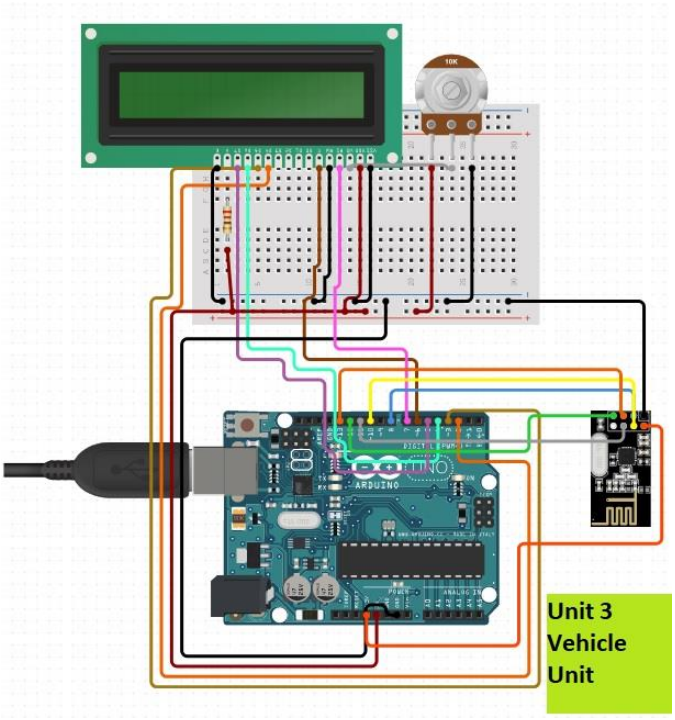

Fig. 8 Circuit of vehicle unit

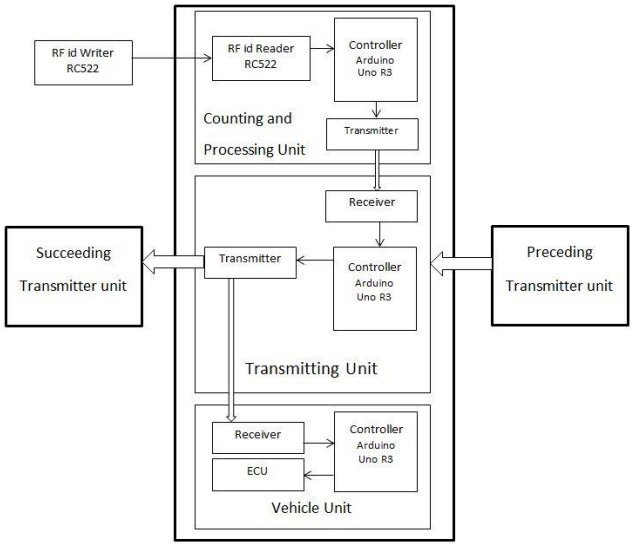

Fig. 9 Block Diagram

VI. FUTURE SCOPE

It will further be used for controlling the traffic throughout the long highways and would be stopping the casualties occurring by overspending. If this system is connected by the ECU system of cars, it would give complete control over-speed of cars.

VII. CONCLUSION

We built a hardware system that can take count of vehicles in a segment of road and can generate the speed to be

followed by drivers in that segment. This speed followed will lead to better traffic management and can control over speeding of cars. No other system is in use by far to control the live traffic by controlling the speed of vehicles. As discussed earlier, we had used (1) Data collection for generating the traffic density value. (2) Data processing for getting speed value. (3) Data transmission for transmitting speed value to vehicle units. We implemented this by connecting electronic devices like transmitter, receiver, RFID reader and writer, display screen with Arduino uno microcontroller.

REFERENCES

[1] Jeroen PLOEG, Alex F.A. SERRARENS, Geert J. HEIJENK. Connect & Drive: design and evaluation of cooperative adaptive cruise control for congestion reduction. Journal of Modern Transportation Volume 19, Number 3, September 2011, Page 207-213

[2] Gummarekula Sattibabu,, B.V.V.Satyanarayan, VV Satyanarayana Kona. INTERNATIONAL JOURNAL OF TECHNOLOGY ENHANCEMENTS AND EMERGING ENGINEERING RESEARCH, VOL 2, ISSUE 8 32 ISSN 2347-4289

[3] United States Patent. Applicant and assignee by jaguar land rover limited. US 9,630,623 B2.Apr. 25, 2017

[4] ResearchGate, Development of a Prototype to Detect Speed Limit Violation for Better Traffic Management. Joyeeta Goswami, Shirsha Ghosh, Shivaditya Katiyar, Alak Majumder,Department of Electronics & Communication Engineering, National Institute of Technology, Arunachal Pradesh, Yupia, India - 791112

[5] ResearchGate, Development of Portable Wireless Sensor Network System For Real-time Traffic Surveillance. Walid Balid*, Hasan Tafish, Hazem H. Refai. Electrical and Computer Engineering Department, University of Oklahoma,Tulsa, OK, USA.