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Smart Driver Assistance System for Automobiles

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Abstract:

Road signs play a very vital role in driving. Driver need to be conscious in observing the Road signs while driving. Human error is very common in these kinds of scenarios. To overcome these Road sign detection by car itself will be better idea. The Road sign can be detected visually by a camera mounted on the Car, but this solution does have some drawbacks like cleaning of sign board, hindrance in the view of Road Sign. To overcome this situation we propose this project, where cars will be easily able to detect the Road sign and reduce the speed of the car to a limited value.

Keywords: GPS, UART, LED, Detect, Camera

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I. INTRODUCTION

Advanced driver systems (ADAS) contain a human machine interface unit and control unit to assist driver in driving vehicle with care and safety. ADAS can be seen as a set of systems that assists the driver to stay in comfort. Most ADAS are of an imminent character, warning the driver in time critical situations. However, critical warning alone is not optimal solution in keeping drivers from avoiding traffic accidents. If the driver misinterprets the warning and takes a wrong action or simply does not react to the warning in time, there is an obvious risk that accidents will occur. If on the other hand, the driver is fully aware of the driving situation and does take appropriate actions before a critical event arises, chances are that fewer incidents will take place and fewer imminent warnings will have to be presented to him. At present the vehicles like car, bus and truck are driven by human. In future the vehicles will be driven by robots. Some important road signs are school zone, crash zone and speed lane. Robot can detect the road signs and control the accelerator, brake pedal and steering of car. Main reason for accidents seems to be car speed. Wired communication is not possible between car and zone because car is moving dynamically. To control car speed, wireless communication can be established between each zone and vehicle. Driver should take care of car speed according to the zone of driving. For instance, consider school Zone, car speed should be fixed below 30 Km. In the proposed system, RF communication is used to link car and the zone. To increase or decrease the car speed PWM technique is implemented. GPS locates the position of car to the driver. UART connects PIC Microcontroller and GPS. I2C Bus is used in communicating PIC Microcontroller and LCD Display in Serial in Parallel out manner. I2C bus is used for LCD display. It is a low bandwidth short distance protocol. It provides a single way talk between ICs by using two wires for serial clock and serial data and both the lines being bi-directional. Here RF communication is used as link between the danger zone and the robotic vehicle. GPS is normally referred to as Global Positioning System. When the vehicle is travelling from one place to another it can be monitored by this GPS. This GPS is mounted on our robotic vehicle and it will provide the latitude and longitude position of the vehicle. There are two zones. They are school zone and crash zone. RF transceiver is placed in each zone and inside the vehicle to establish wireless communication. LED indicator indicates whether RF link exists between car and zone. When the car is moving near school zone, the RF transceiver placed in that zone will transmit the signal to the car which is crossing the school zone. PIC microcontroller placed in the car will receive that signal and control the car speed using PWM (Pulse Width Modulation) technique. PWM is used to control the car speed by varying the duty cycle of the control signal. To increase the car speed, duty cycle will be reduced and to decrease the car speed, the duty cycle will be increased. By increasing the duty cycle, the car speed will be reduced below 30Km. GPS (Global Positioning System) is installed inside the car to indicate the position of the car to owner and avoid theft. UART connects the GPS to PIC microcontroller placed inside the vehicle. UART (Universal

Asynchronous Receiver Transmitter) is used for asynchronous transmission. PIC will transmit the position of car to LCD display through I^2C network.PIC Microcontroller will give the output to LCD display in parallel manner. But LCD display will get the input in serial manner. To solve the problem the I^2C network is used in serial in parallel out mode. Thus, by using RF communication and PIC Microcontroller we can detect the road signs and limit the car speed.

This proposed system is divided in two parts

i) Smart driver vehicle

ii) Wireless Electronic sign board

The wireless electronic sign board transmits, its ID to vehicle and the incoming vehicle detects the ID and understands the ID and identifies type of sign board. The Smart driving system is fitted with GPS for monitoring the vehicle position. The vehicle position is sent on GSM network, in case of theft reported by the owner of the vehicle. The smart vehicle is also fitted with a alcohol detection system. The vehicle does not start if vehicle detects drunk driver inside the vehicle. Road signs play a very vital role in driving. Driver need to be conscious in observing the Road signs while driving. Human error is very common in these kinds of scenarios. To overcome these Road sign detection by car itself will be better idea. The Road sign can be detected visually by a camera mounted on the Car, but this solution does have some drawbacks like cleaning of sign board, hindrance in the view of Road Sign. To overcome this situation we propose this project, where cars will be easily able to detect the Road sign and reduce the speed of the car to a limited value. Road sign detection becomes very important to an automatic vehicle that drives on roads automatically. This paper describes a fast method for locating and recognizing road signs in a sequence of signals. Advanced Driver Assistance Systems, or ADAS, are systems to help the driver in the driving process. When designed with a safe Human-Machine Interface, it should increase car safety and more generally road safety. Intelligent vehicles refer to cars, trucks, buses, etc. on which sensors and control systems have been integrated in order to assist the driving task, hence their name Advanced Driver Assistance Systems (ADAS).

II. PROBLEM IDENTIFICATION

Most road accidents occurred due to the human error. An increasing number of modern vehicles have advanced driver-assistance systems such as electronic stability control, anti-lock brakes, lane departure warning, adaptive cruise control and traction control. These systems can be affected by mechanical alignment adjustments. Advanced driver-assistance systems are systems developed to automate, adapt and enhance vehicle systems for safety and better driving. The automated system which is provided by ADAS to the vehicle is proven to reduce road fatalities, by minimizing the human error. Safety features are designed to avoid collisions and accidents by offering technologies that alert the driver to potential problems, or to avoid collisions by implementing safeguards and taking over control of the vehicle.

III. PROPOSED SOLUTION

We propose a microcontroller based smart system for detecting the school zone and hospital zone with use of RF technology. The proposed system is divided in two parts; the first part needs to be placed near to the hospital or school zone, the second part needs to be placed in the vehicle. The system uses RF technology to communicate each other to provide information regarding the school or hospital zone. The module mounted near to school consists of zone ID generator module along with encoder module and 433MHz transmitter. The Zone ID module is fixed for hospital and school zone and this ID is transmitted in air all the time using 433MHz RF technology. The module mounted in the vehicle consist of 433MHz RF receiver module, which receives the information available in air and decodes it using the decoder circuit. The decoded information is passed to the microcontroller through parallel lines. The microcontroller controls the speed of the vehicle through motor controller module according of the data received from decoder module.

In addition to that system consists of alcohol sensor, which does not allow vehicle to start in case the driver is drunk. The system also implements vehicle tracking system using GPS (**Global Positioning System**) and GSM (**Global System for Mobile**). The vehicle user needs to send to send an SMS in case of vehicle theft. The system receives the SMS and sends the vehicle current position, which it gets from GPS. The GPS and GSM module both communicates to microcontroller on UART (**Universal Asynchronous Receiver/Transmitter**) port.

IV. BLOCK DIAGRAM

The proposed system is designed using an ATMEGA microcontroller. The GPS location of vehicle is accessed using a GPS module. This information is sent to the user mobile via GSM module. The GSM module is also connected to the same microcontroller. The sign boards transmit their ID over RF module and vehicle contains a receiver module, which receives

the signal. The microcontroller then decodes the information then slows down the vehicle speed accordingly using PWM. A alcohol sensor is used to avoid the drunk and drive situation, if it detects the driver drunk the sensor stops the vehicle by getting ignited.

This proposed system has two separate systems. The fig. 1 shows the smart driver vehicle system block diagram and fig. 2 shows the wireless electronic sign board block diagram.

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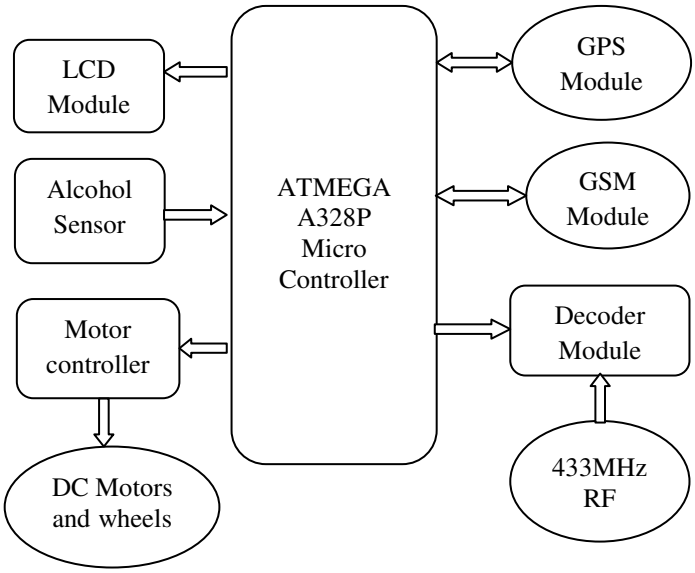

Fig. 1: Smart driver vehicle

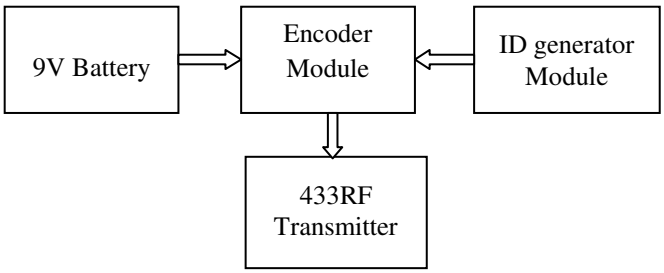

Fig. 2: Wireless Electronic sign Board

ATMEGA 328P Microcontroller: The ATmega328 is a single-chip microcontroller created by Atmel in the mega AVR family. It has a modified Harvard architecture 8-bit RISC processor core. 433MHz Receiver and Transmitter: The 433MHz transceiver/receiver modules are used on a wide variety of applications that require wireless control. Specifications RF 433MHz Receiver: Frequency Range: 433.92 MHz, Modulation: ASK, Input Voltage: 5V Specifications RF 433MHz Transmitter: Frequency Range: 433.92MHz, Input Voltage: 3-12V GSM Module: GSM is a mobile communication modem; it is stands for global system for mobile communication. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands.

GPS Module: A GPS navigation device, GPS receiver, or simply GPS is a device that is capable of receiving information from GPS satellites and then to calculate the device's geographical position.

Alcohol sensor Module: An alcohol sensor detects the attentiveness of alcohol gas in the air and an analog voltage is an output reading. The sensor can activate at temperatures ranging from -10 to 50° C with a power supply is less than 150 Ma to 5V. The sensing range is from 0.04 mg/L to 4 mg/L, which is suitable for breathalyzers.

Decoder and Encoder Module: Decoder is a combinational logic circuit that converts binary information from the n coded inputs to a maximum of 2^n unique outputs. They are used in a wide variety of applications, including data demultiplexing, seven segment displays, and memory address decoding. An encoder is a device, circuit, transducer, software program, algorithm or person that converts information from one format or code to another, for the purposes of standardization, speed or compression.

LED Board: LED Display (light-emitting diode display) is a screen display technology that uses a panel of LEDs as the light source

LCD Module: Stands for "Liquid Crystal Display." LCD is a flat panel display technology commonly used in TVs and computer monitors. It is also used in screens for mobile devices, such as laptops, tablets, and smart phones.

DC Motor: A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields.

9V-12V Battery: Batteries are a collection of one or more cells whose chemical reactions create a flow of electrons in a circuit. All batteries are made up of three basic components: an anode (the '-' side), a cathode (the '+' side), and some kind of

electrolyte (a substance that chemically reacts with the anode and cathode).

The wireless electronic sign board transmits, its ID to vehicle and the incoming vehicle detects the ID and understands the ID and identifies type of sign board. The wireless electronic sign board consist of 4 bit ID generator, which is made using switches. The Encoder module converts 4 bit parallel data into 1-line serial data. The Serial ID data gets transmitted using RF433 MHz module. The system is operated through 9V power supply.

The Smart driver vehicle system has ATMEGA328P microcontroller. The system consists of an RF433MHz receiver, which receives serial data transmitted via wireless electronic sign board. The Decoder module converts 1-line serial data to 4 bit parallel data. The 4 bit data is sensed by the microcontroller and speed of vehicle is controlled by PWM signal of microcontroller. The PWM signal is fed to L923D based motor driver module, which controls the speed of vehicle. In case the driver is drunk, alcohol sensors mounted in the vehicle sense that it does not allow vehicle movement.

The vehicle is mounted with anti theft system. This is implemented using GSM and GPS module. In case of theft user sends a MSG of specified mobile number. The ATMEGA microcontroller decodes the SMS and fetches its location using GPS module. This location latitude and longitude information is sent to user mobile number. This system runs on 12V battery for demonstration purpose.

V. CONCLUSION

The objective of this project to detect road signs and limit the car speed and it is achieved by establishing RF communication between the car and the zone. The car speed is adjusted according to the area of driving. RF communication exists between the car and the zone. And by Pulse Width Modulation technique, car speed is limited by varying the duty cycle of its control signal. LCD displays the location of the car by using GPS. Thus, this project improves the safety and security of driving. The cost of its implementation is also very low. Although the RF communication range of WPAN is limited to 400 ft, it can be used for actual application by intelligent placement of motes relative to a zone. ADAS can also be implemented using existing RF communication systems, where GPS can be a speed control tool when it is used with predated map of the location where the car is headed. The vehicle will report its GPS location at every 2 minutes, once user reports the theft of vehicle. If the driver is drunk the alcohol sensor stops the car by getting ignited.

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