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Wireless Safe, Smart and Secured Driving System

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Abstract
The development of the new technologies in the field of automotive electronics has brought tremendous changes in the day to day life of every human being. The driver assistance system are meant to support driver with driving process in order to avoid accidents which enable various user to be better informed and makes safer, more coordinated and smarter use of transport networks. In this paper Vehicle to Roadside unit communication has been addressed. All the information is collected and processed to offer useful services such as safety and security, with the help of Transceivers for the wireless communication.
Keywords: *Transceivers, Bluetooth module, MQ-3 sensor, PIC 16F877A, LCD, Android device.*

1. Introduction

Road facilities are major concern in the developed areas. Recent study shows that about 60% of roadway accidents are due to unaware about the road map, unconsciousness of driver etc. Many of us face difficulties in unlocking/locking the car because of easily available duplicate keys.
These issues have been addressed in this paper and could be avoided by informing drivers about overcoming road work area. Emerging technologies appears to provide faster, safer and more reliable communication techniques. The aim of this paper is to build a reliable driving system for road infrastructure to vehicle communication, which can transmit the information provided by active signals placed on the road to prevent collision. There are different kinds of methods to assist drivers such as GMS, GPS, ZigBee etc. one of those methods is Transceiver.
Drunk driving is a major reason of accidents in almost all countries and all over the world. Alcohol detector in vehicles is implemented for the safety of the people for sitting inside the vehicle.
Only having a key, vehicle is not secured because of duplication of keys. So, to have security, in this System password is provided along with the key using HC-05 Bluetooth technology and smart phone.

2. Methodology

Fig. 1 shows the overall block diagram of the Wireless Safe, Smart and Secured driving system.

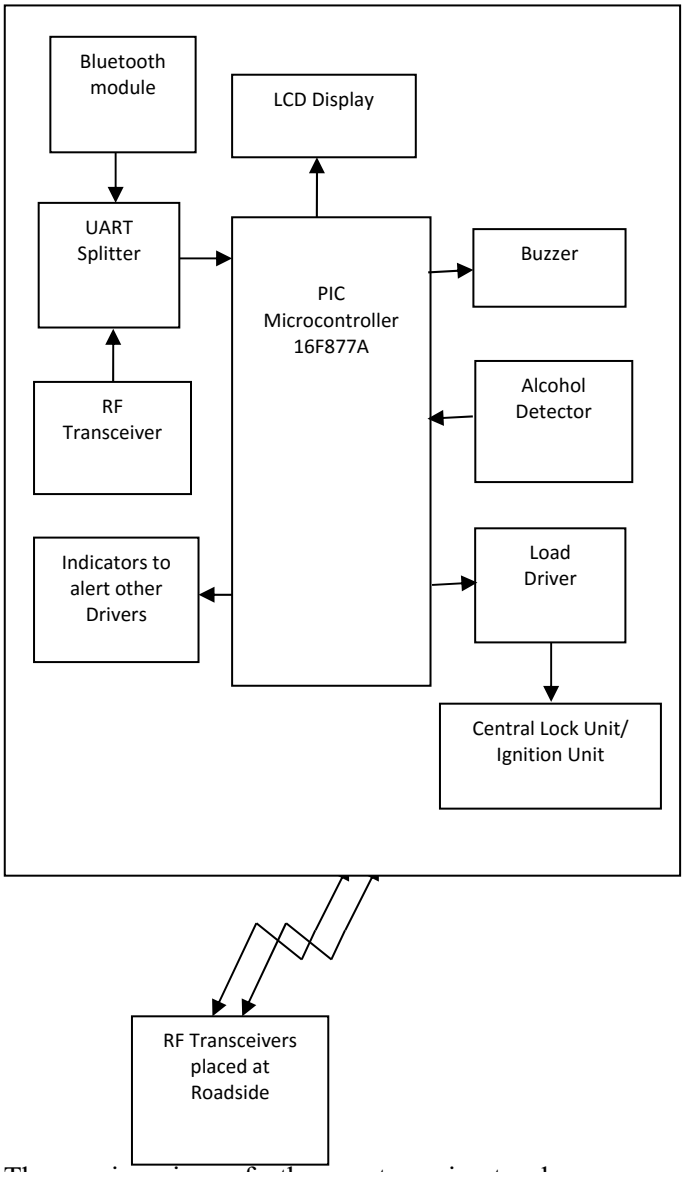

Fig. 1 : Block Diagram of system

communication between Roadside Unit (RsU) and

On-Board Unit (OBU).The OBU has a Bluetooth module, transceiver module and PIC controller.

The Bluetooth module, shown into the Fig. 2 is HC-05 module which is an easy to use Bluetooth SSP (Serial Port Protocol), designed for transparent wireless serial connection setup. It can be used in a master or slave configuration making it a great solution for wireless communication. Serial port Bluetooth module is fully qualified Bluetooth V2.0+Enhance Data Rate (EDR) 3Mbps modulation with complete 2.4GHz radio transceivers and baseband. It has some hardware features like UART interface with programmable baud rate 3.3 to 5V I/O, Up to +4dBm RF transmitter, programmable I/O control and software features like 8bit data, slave baud rate 9600, 0ne stop bit and no parity. It consists of default auto pairing pin code which is "1234". [1] Through Bluetooth module we can achieve security by providing password using cell phone (android) to control the vehicle, the appropriate password is checked by PIC controller. The vehicle will be turned on only when appropriate password is provided along with key. This action is indicated by the buzzer and also using LCD with appropriate messages. Once the vehicle is turned on, through UART splitter the communication switches from Bluetooth to transceiver.

Fig. 2: HC-05 (Bluetooth module)

Fig. 3 shows the transceiver (HC-12) is used in RSU as well as in OBU. It is a wireless serial port communication module, known as new generation multichannel embedded wireless data transmission module. Its working frequency band is 433.4 – 473.0 MHz with the stepping of 400 KHz and there are totally 100 channels so the multiple channels can be set. The product features are long distance wireless transmission around 1Km in open space/baud rate 5000bps in air, the maximum 100mW (20dBm) transmitting power. All transparent transmission modes are only responsible for receiving and sending serial port data, so it is convenient to use. The transceiver used at the RSU, It gives all the road related information. Whenever the receiver comes within the range of transmitter, the Receiver receives the message through the serial port and processes with the help of PIC controller. The pin diagram is shown in Fig. 4. The messages such as deep curves [left / right], bridges, junctions, sensitive zones like school, hospital, defense area etc. which is indicated by buzzer and LCD display.

Fig. 3: HC-12 (transceivers)

The term PIC stands for Peripheral Interfaces Controller. This device was originally design for use in application with 16-bit microprocessors, computer peripheral, remote control transmitters, domestic products and automotive systems. [4] The PIC16F877A has features such as 256 bytes of EEPROM data memory, rich in peripherals, self programming, an ICD (In Circuit Debug) via two pins, watchdog timer (WDT) with its own on chip RC oscillator for reliable operation, low power, high speed flash/EEPROM technology, wide operating voltage range (2.0V to 5.5V), synchronous serial port (SSP) with SPI (master mode) and I2C (master slave) and inbuilt ADC. A simple microcontroller consist of following modules in an arithmetic and logical unit (ALU), one or more registers foe temporary storage during computation, program memory, data memory, program counter, instruction registers, the control unit and stack.

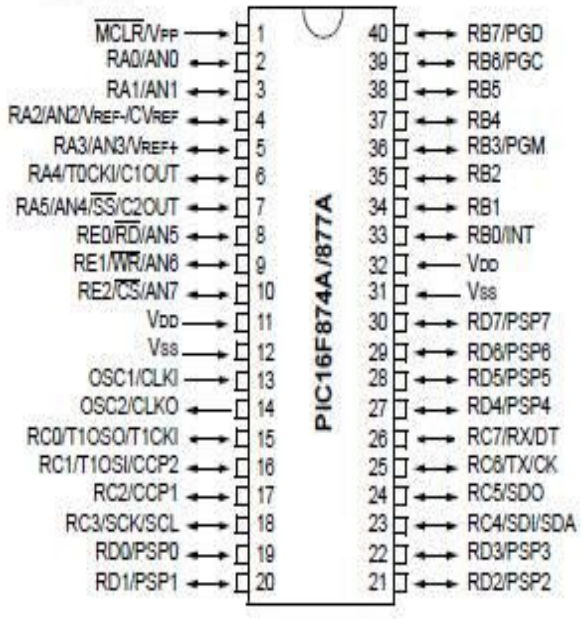

Fig. 4: PIC16F877A

The MQ-3 sensor, shown into the Fig. 5, is used to detect the presence of alcohol gasses. It has high sensitivity and fast response time. It is compatible with 5V AC or DC circuit, it requires heater voltage. The dimension is 16.8mm in diameter. Whenever the sensor comes in contact with ethanol present into the human breath is detected by the sensor. At the same time driver will get the warning messages for the specific interval of time to turn off the vehicle, through LCD and buzzer. If driver is unable to turn off, the vehicle will be automatically turned off and indicators of the vehicle will be turned on to alert the other drivers.

Fig. 5: MQ3 sensor

Fig. 6 and Fig. 7 show the transmitter and receiver of the system respectively.

Fig. 6: Transmitter (RSU)

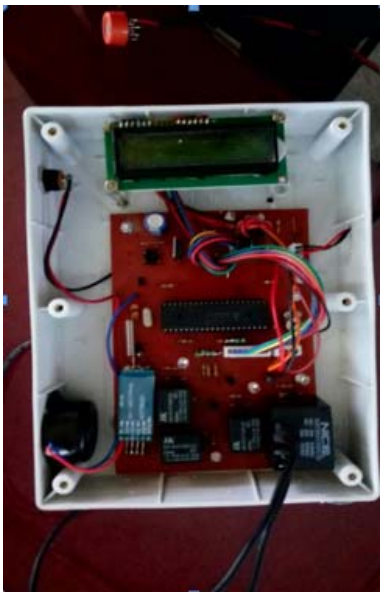

Fig. 7: Receiver (OBU)

3. Flow chart

Fig shows the flowchart of the system. As shown in Fig. 8 first driver has to enter the authorized key through android using Bluetooth. The PIC controller continuously checks the key if key is correct then vehicle will turned on. At the same time Bluetooth module deactivates and transceiver module activates. Receiver continuously checks the RF signal and sensor signal. If the sensor signals are detected then PIC controller displays warning message with buzzer to turned off the vehicle, and after some delay vehicle will turned off. Else if RF signal are received then PIC displays related messages of corresponding area.

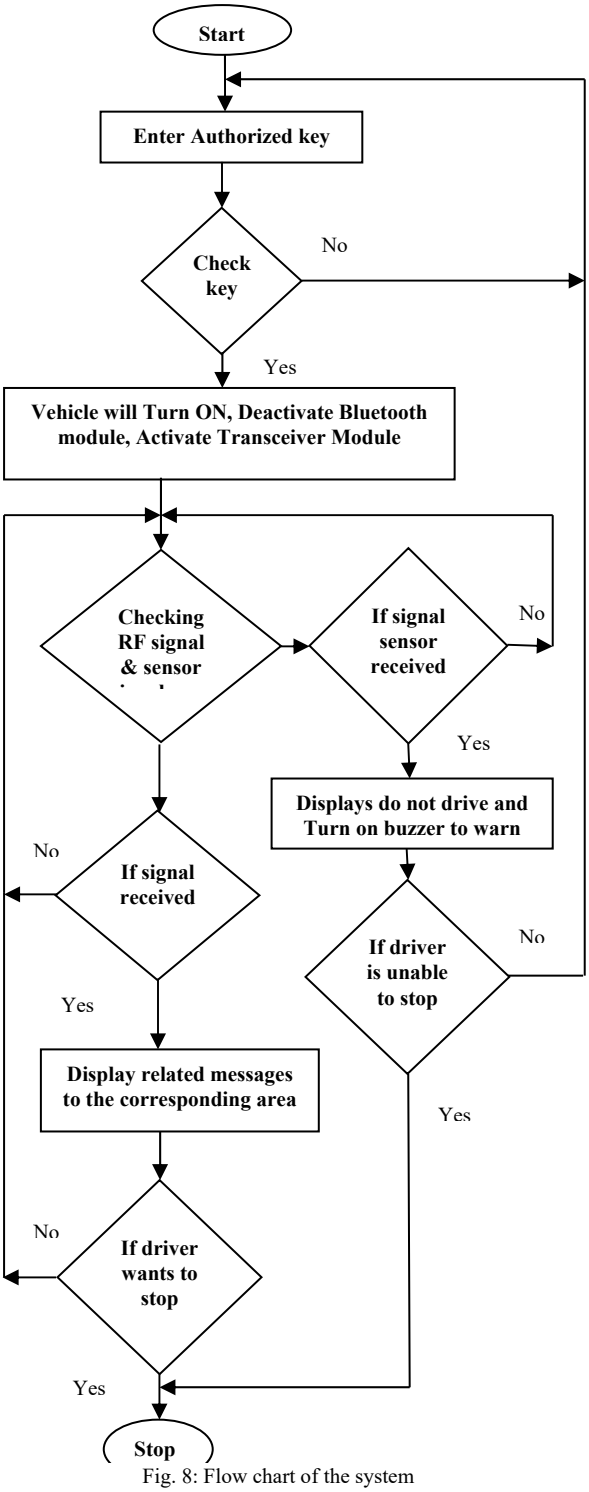

Fig. 8: Flow chart of the system

4. Applications

1. Smart vehicle transportation
   - Safety applications - Safety applications include monitoring of the surrounding road, surface of the road, road curves etc.
   - Smart applications - It includes efficient transport and management applications focusing on optimizing flows of vehicles by reducing the travel time and avoiding any traffic congestions. Here sensors are used to provide different levels of functionality e.g. alcohol sensor.
   - Secured applications - It includes a secured code used to unlock the car which minimizes threat of car key theft.
2. The reduced speed zone warning: It is safety application feature the concept of reduced speed zone where a reduction in transit approaching speed is required such as entrance to work zones, school zones and road way configuration alteration (e.g. Lane closure, lane shifts).

5. Results

- The real time working of system is presented in Fig. 9.
- It displays road details on LCD that is fitted in dash board.
- Speed / no horn warning will be given in sensitive areas like school, hospital, defense zones etc. as shown into the Fig.11.
- Controls ignition based on command sent through Android Application.
- Activates / De-activates central locking system based on users commands such as alcohol detection as shown in Fig. 10.

Fig. 9: Real time working of model

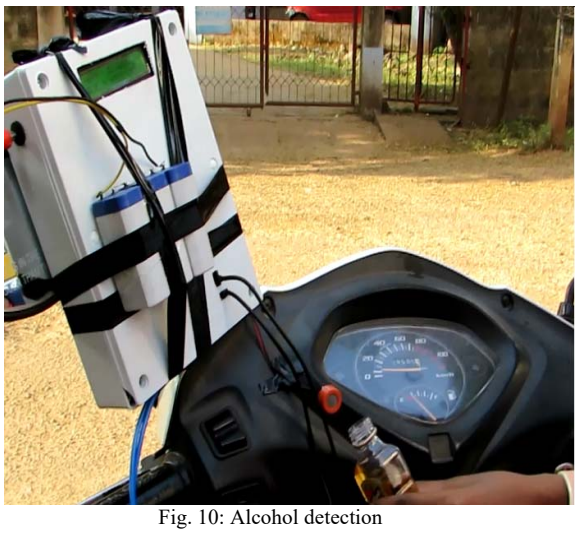

Fig. 10: Alcohol detection

Fig. 11: Display of Road related information

6. Conclusion

The road related information issue can be overcome by GSM, GPS, ZigBee, Bluetooth etc. But GSM and GPS has some limitations in remote areas, whereas ZigBee and Bluetooth has range and node problem so Transceivers is better option for implementation of this system in this way the issue of unawareness of road related information is addressed. High Alcohol consumption issue is addressed by detecting alcohol and warning the driver. Also security has been addressed by providing user defined password. This system is suitable to all currently available vehicles.

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