

An Embedded System for Enhanced Passenger Security in Radio Cabs 33

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ABSTRACT

With the world turning towards wireless and radio systems in every field, the use of better communication technology has been the prime focus for all major industries. India has been adopting such systems on a large scale to meet the demands of a large and diverse population. Radio Cabs have been on a tremendous hike during the past few years. The industry has crossed a record-breaking turn over with all the companies aiming at better and comfortable services. During the past three to five years, Delhi has seen some worst rape and crime scenes involving cabs directly or indirectly. This raises a question mark on the safety and reliability of these services, even in the capital city of one of world's fastest growing countries. This paper is based on enhancing the safety and reliability of these services.

Keywords: GPS, Tracking of vehicle, Safety and Security Enhancement, GSM, RFID

I. INTRODUCTION

This concept installs a panic button system in the car, which is directly connected to the car's ignition system. Whenever the passenger feels unsafe, he/she can press this panic button. As soon as the button is pressed, the car ignition is turned off. The system commonly uses a Global Positioning System (GPS) for locating the vehicle and sending this location to the nearby police station through the use of GSM (Global System for Mobile Communication).

The Audio Playback module incorporated in the system starts recording the conversation going on at that particular instant. This recording can later be used as an evidence for legal proceedings as well. An alarm for gaining the local attention for immediate help.

To enhance the security of this system, an RFID module is employed in the circuit, which is connected to the power supply of this panic button system and the car ignition. The car ignition would only work if the driver's details were matched with the RFID tag. This means that the car would only work when the Panic button system is working, since the RFID reader is essential for the ignition to work. Hence, a driver cannot bypass the panic alarm system.

II. EXISTING SYSTEMS AND THEIR DRAWBACKS

'Nirbhaya', is a Women Safety mobile application of Uttar Pradesh Police. It is currently available for Noida residents. It sends a distress message to a specified contact group in an emergency confronting a woman. It sends an alarm through SMS denoting a woman's location, to the configured

group through GPS. It is used for communicating exigencies like accidents apart from attempted molestation through pre-defined text messages, as well.

The literature review about the previous work related to vehicle navigation reveals that tracking of the vehicle is carried out with the help of SOS button; a single click on the button, present in the Radio cabs' application will enable the passenger to escalate matters of safety and related concerns to the concerned safety response team in real time. This feature is implemented in common radio cab online transportation network companies such as Ola and Uber.

In the existing systems, safety is provided only through GPS module, where the location of the person in danger is sent to the concerned authority in real time. Whereas, no other measure is taken in order to ensure the safety of the passenger.

When a passenger is in a critical situation and is in need of immediate help, opening the application and requesting for help through SOS buttons and other such message sending modules, is not an optimized solution.

III. PROPOSED SYSTEM

In the system proposed in this paper, we will overcome the above drawbacks by introducing a physical button/switch placed inside the radio cab, known as Panic Switch. A passenger in need will not have to open an application in order to cry out for help but press a switch placed around him/her.

An enhanced security is provided through incorporating a RFID reader into the surveillance system. Using this, the authentication of the driver is checked. If the driver fails to pass the authentication, the car ignition will fail, as the DC motor connected to the micro-controller

(controlling all the modules) will not start. Once the authentication is checked for, only then will the driver be able to start the ride.

When the Panic Switch is pressed during an emergency by the passenger, the following features will get activated in order to provide safety to the passenger:

1. The car ignition stops as the DC motor will automatically stop on pressing the Panic Switch
2. A buzzer/ an alarm will ring to alert local people around the radio cab for immediate first hand help
3. An alert message will be sent to nearby Police Stations and concerned safety authorities of the Radio Cab Network through GSM module
4. The location where the incident has happened and the passenger is in emergency, can be tracked in real time through an application on the concerned authorities' mobile phones using GPS(A pop up notification will arrive denoting that a passenger is in trouble)
5. The Audio Playback module incorporated in the system starts recording the conversation going on at that particular instant. This recording can later be used as an evidence for legal proceedings
6. An alcohol sensor is incorporated near the driver's seat in order to sense if the driver is drunk or not. In case the driver is drunk, the engine (DC motor in this case will not ignite)

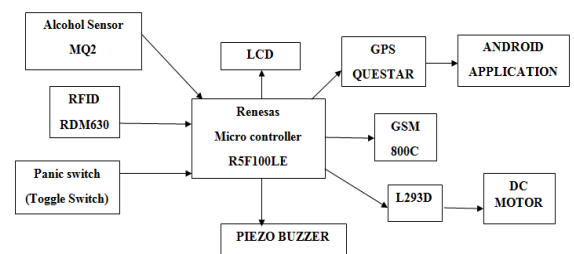


Figure 1. Block Diagram of the Proposed System

IV. TECHNOLOGIES

An Embedded System is a computer system with a dedicated function within a larger mechanical or electrical system, often with real time computing constraints. It is embedded as a part of a complete device often including hardware and mechanical parts.

In the proposed system, we include the following technologies as a part of the Embedded System, to meet the requirements:

A. Microcontroller

Renesas R5F100LE belongs to RL78/G13 family. The main features of this microcontroller are as follows:

- Lowest level of consumption current
- High speed operation of 32MHz main clock, when supplied with 2.7 to 5.5V
- Both flash memory programming and on-chip debugging are supported

B. Global System for Mobile Communication (GSM)

- SIM800C is a complete Quad-band GSM/GPRS solution in a SMT type, which can be embedded in the customer application.
- SIM800C supports Quad-band 850/900/1800/1900 MHz; it can transmit voice, SMS, and data information with low power consumption.
- With tiny size, it can smoothly fit into slim and compact demand of customer design

C. Global Positioning System (GPS)

- A GPS navigation device is a device that accurately calculates geographical location by receiving information from satellites
- The GPS Questar is a compact all in one GPS module solution intended for a broad range of original equipment manufacturer products
- The receiver continuously tracks all satellites in view and provides accurate satellite positioning data

D. Radio Frequency Identification (RFID)

- RDM6300 125KHz card-reader mini module is designed for reading code from 125KHz card compatible read-only tags and read/write card
- Maximum effective distance up to 50mm
- Less than 100ms decoding time

E. Audio Recording and Playback Module

- APR 9301 is a single chip Voice Recorder and Playback device for 20 to 30 seconds Voice recording and Playback
- It is an Ideal IC for automatic answering machine, door phones etc
- This IC has Data Storage Capacity and requires no software and microcontroller. It provides high quality voice recording and playback up to 30sec

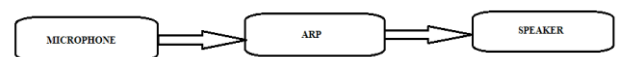


Figure 2. Block Diagram of the APR (Recorder)

F. Alcohol Sensor

- The Grove-Gas sensor(MQ2) module is suitable for detecting H2, LPG, VH4< CO, Alcohol, Smoke, Propane
- Due to its high sensitivity and fast response time, measurement can be taken as soon as possible
- It can sense up to a maximum distance of 30cm

V. APPLICATION

An Android Application is developed, in order to track the passenger's location. This application will be installed in concerned authorities' mobile devices. Whenever a passenger presses the panic button, through GPS, the location of the passenger is sent to

all the registered mobile numbers through the GSM module. The application opens instantly, retrieves the location, and tracks the passenger in real-time using Google maps.

VI. RESULT

The above-mentioned modules are coded using Embedded C and the code is dumped into the Microcontroller. An Experimental set up/prototype is tested to validate all the security measures.

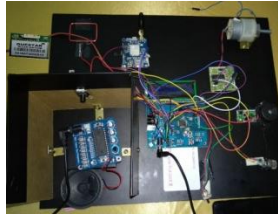


Figure 3. Prototype of the Proposed System

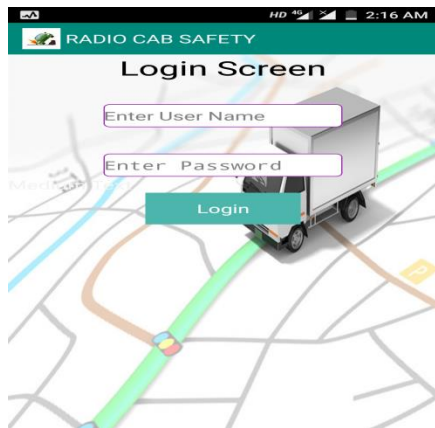


Figure 4. Login Screen of the Application

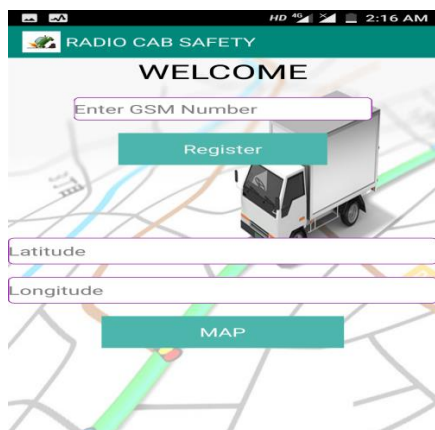


Figure 5. Screen that Retrieves the Passenger's location

VII. CONCLUSION

Providing security is the fundamental aim of this paper. GSM and GPS together will help in finding the crime location. Recorder audio will be useful in post-crime investigation. RFID reader will prevent access to unauthorized users and the buzzer will help in gaining the local attention.

In future, this system can be enhanced for security at a higher level by incorporating the following features:

1. A live transmission of the scenario with wi-cam
2. A biometric system to authenticate the fingerprint of the driver and hence prevent the ignition of car without authorized usage

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