

Fingerprint Based Smart Pay and Accident Alert System

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Abstract—Over the last few decades, the usage of public transportation is attracted by most of the people. The increase in passenger count has made ticket ending and vehicular monitoring a complex task. In addition to this, frequent accidents occur due to overload of passengers and these accidents are not cognizant to the rescuers. Therefore advancement in technology could be instigated to overcome these issues. This system is an advanced approach to the existing system of ticketing through RFID cards. The fingerprint based smart pay and accident alert is the proposed system wherein ticketing is automated and the travelling cost is debited from the concerned bank or the suggested system where the user holds an account. To avoid illegal entry, the passenger count is monitored with the effective utilization of IR sensor. The ignition of the vehicle is stopped whenever the passenger count exceeds the maximum value. The accident alert system finds its application in the proposed methodology with the support of GPS and GSM. Whenever an accident occurs, the location of the vehicle will be sent as a message with a link provided to the emergency vehicles, control room and a private message will be sent to the trusted contact of each of the passengers. Thereby many fellow lives could be saved. This system would also be an excellent replacement to the traditional ticketing system.

Index Terms— Accident Alert, Biometrics, GPS, GSM, Ignition Control, Ticket Vending.

1 INTRODUCTION

The public transportation is of the primary concern for most of the people in recent times. The advancements in technology are being introduced in various transportation infrastructures and one such is the ticketing system. Currently the ticketing system that is performed is mainly man power dependent. During the peak hours ticket vending seems to be a challenging task. Thus the proposed system will be an excellent method for an automatic ticketing mechanism using embedded system.

Here the ticketing system is performed with the help of biometric fingerprint scanning whereby the fingerprint verification will find the access from the corresponding bank account or from a suggested methodology in which the passenger holds an account with the public transportation that matches the biometric information. Thus the ticketing cost will be debited on the completion of the travel. Nowadays the increase in careless accidents is in a peak because of overload of the passengers. The system also incorporates the usage of the IR sensor that counts the number of passengers. Once the passenger count exceeds the maximum allotted count, the ignition of the vehicle will be stopped.

In addition, the proposed method also finds its contribution with the accident alert system. Whenever an accident takes place the emergency vehicles find difficult to find the position of the vehicle unless any of the pedestrians is aware of the accident. Thus the accident alert system have been included wherein, if an accident occur, suddenly a link consisting of the exact location of the vehicle is sent as a message to the emergency vehicle, nearby control room and to the trusted contacts of the passengers inside the vehicle.

Thus this proposed system will be an excellent alternative to existing traditional ticketing system. The GPS tracking and GSM here are used for alerting the trusted contacts thereby rescuing the lives of fellow beings without any delay in the process. Thus, the fingerprint based smart pay and ignition control system would be a key in the development of intelligent transport systems. These have also shown promising results for the practical applications.

2 SYSTEM OVERVIEW

The proposed system consists of three subsystems that are mounted in the vehicle, namely, the ticketing subsystem, ignition control subsystem and the accident alert or the tracking subsystem. Some of the important hardware components available that make up the proposed system are R305 (fingerprint module), SIM900, GPS Module, IR sensor, ATMEGA 162, RS 232, Buzzer, relay. The operation of each is unique in this system.

2.1 ATmega162 Microcontroller

ATmega162 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. It is a 40 pin Dual Inline Package and a low cost controller that is commonly available and that has sufficient memory. By executing powerful instructions in a single clock cycle, the ATmega162 achieves throughputs approaching 5MIPS per 8MHz allowing the system designed to optimize power consumption versus processing speed. ATmega162 in the proposed system provides the serial communication for all the subsystems such as the fingerprint module, the personal computer to display the database, GSM module and the GPS module.

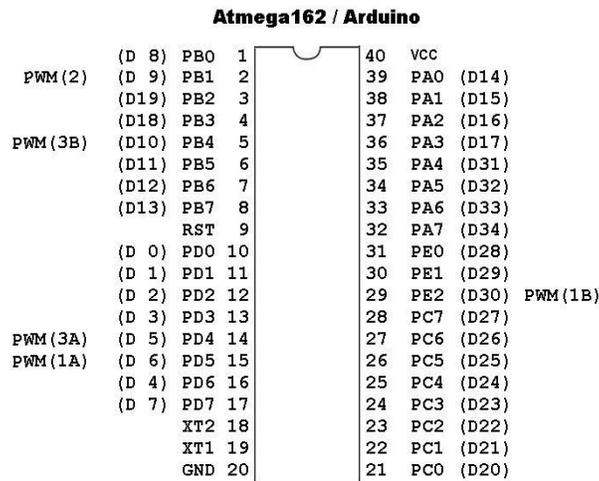


FIG.1

2.2 IR Sensor

An IR transmitter/LED is a device that emits infrared light outside the visible spectrum. It emits the light near-infrared energy at about 880nm. The device that detects or receives the IR light is called infrared sensor which senses some aspects of its surroundings. Here IR sensor is used to count the number of passengers getting into the vehicle. The IR receiver output is used to trigger the timer. Whenever the IR radiation is received triggering occurs indicating “no passenger” condition, resulting in *high* output. When a passenger arrives and steps in at the entrance of the vehicle, the IR rays are blocked by the human body and the output toggles to low. Hence counts the value as 1 and it further increases by a count when the next passenger enters.

2.3 Fingerprint Module

The fingerprint module is used to sense and collect the biometric information of the passenger. The module consists of two sections: sensor and data conversion. It has 512 kb of flash memory that can be overwritten up to 10000 times. Initially, the finger is sensed and the image is captured by the sensor. Two operations are being performed by the module as enrolling and matching. Whenever a new user is detected, the finger is tested twice so that the images are merged together to form a template. The data conversion takes place by converting the template to character file and stored in the module memory. Matching occurs at the first instance wherein the results are acknowledged to the MCU.

2.4 GSM Module

GSM module is a specialized type of modem which accepts a SIM card and operates over a subscription to a mobile operator just like a mobile phone. From the mobile operator perspective, a GSM modem just looks like a mobile phone. A GSM modem may be a dedicated modem device with a serial, USB or Bluetooth connection or it may be a mobile phone with the appropriate cable and software driver to connect to a serial port or USB port on your computer.

2.5 GPS Module

GPS is a way of locating a receiver in the three dimensional space anywhere on the earth. In order to keep tracking a vehicle, the GPS receiver is connected to the serial port of the microcontroller. This complete GPS receiver is designed for a broad spectrum of OEM system applications. Here the GPS module is laid up in such a way that it continuously tracks the position of the vehicle and navigates periodically. Its far-reaching capability meets the sensitivity requirements of land navigation as well as the dynamics requirements of high performance vehicles. It has an inbuilt memory to save the navigation results and has been proved itself to be a low power consuming module.

2.6 Vibration Circuit

The vibration circuit is used to sense the mechanical vibration. This is constructed with the piezo electric plate, operational amplifier and 555 Timer IC. The piezo electric plate converts the mechanical vibration into electrical energy of mV. The amplifier amplifies this signal and produces an AC output signal. The 555 timer in turn produces a square pulse that generates a signal to the microcontroller.

3 LITERATURE SURVEY

Christian Oberli et.al [1] in the paper titled “Performance Evaluation of UHF RFID Technologies for Real-Time Passenger Recognition in Intelligent Public Transportation Systems”, explained an automated passenger tracking in public transportation system. This system determines the origin–destination matrix and to maintain statistics of each passenger’s transportation habits over time, thus enabling enhancements in long-term planning.

Kichun Jo et.al [2] the paper titled as “Interacting multiple model Filter-Based Sensor Fusion of GPS with In-Vehicle Sensors for Real-Time Vehicle Positioning”, portrays the low cost GSM for conventional automotive applications. The paper presents a positioning algorithm based on an interacting multiple model (IMM) filter that integrates low-cost GPS and in-vehicle sensors to adapt the vehicle model to various driving conditions. Experimental results show that the performance of the positioning system is accurate and reliable under a wide range of driving conditions.

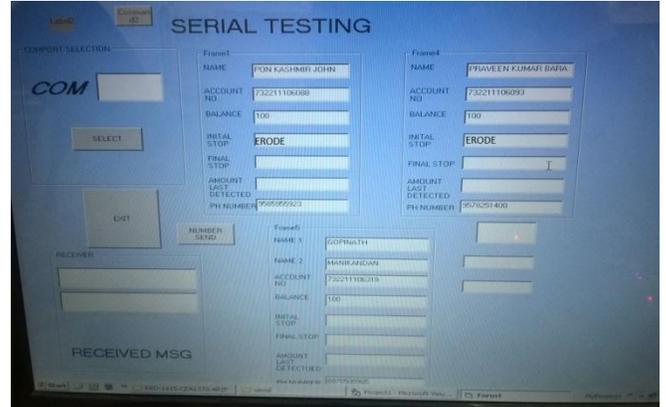
M. Bhuvanewari et.al [3] the paper titled as “Embedded system based automatic ticket vending machine for modern transport system”. This paper is based on RFID and ZIGBEE technique. In this automated system the traditional ticket system by smart card that contains all details of the user including bank account information which is similar to the ATM card. The machine consists of display which shows the availability of buses for all destinations. The person can find out the destination place by pressing the buttons available with the help of ZIGBEE. If the location is selected then the availability of buses along with the time is displayed. If the people confirm to go in certain bus, by using smart card the person can receive the tickets employing RFID technique and by showing the ticket in front of the bus the door opens automatically and after some predetermined seconds it gets closed. Voice GPS is placed inside the bus and the display

shows the route map. The PIC microcontroller is pre-programmed to do the operations. This is used to minimize manpower in buses and ticket counters, predetermining of the bus can be done to find the destination exactly, safe journey can be assured without any disturbance and system based booking for easy usage.

Vishnoo Prashanth.R et.al [4] the paper titled “Bus Ticket Booking and alert system using UID”, focused in providing fingerprint based ticketing system in which the ticket is pre booked. It also portrays the alerting system in a timely basis wherein the location of the bus is sent to the passenger waiting for the bus. An UID code is provided to the passenger at the time of booking. The GPS module is used for tracking the vehicle and the GSM kit sends the alerts to multiple passengers at an interval of 10 minutes regarding the arrival of the vehicle. The system is a completely

vehicle. The scanner checks the biometric data and if it matches with any of the database, the control is sent to the pc with VB programming. The PC now sends an ACK to the controller and the particular account is accessed.

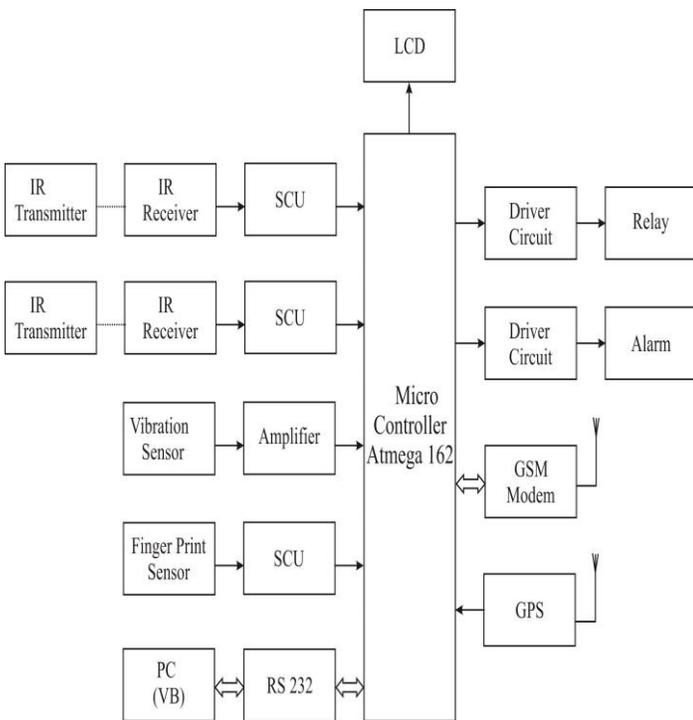
Then the passenger is subjected to an IR Sensor at the door step.



If the IR count is mismatched with the fingerprint count then the buzzer alarms. The switching relay of Single Pole Double Throw Switch is implemented for two Serial port connections. When the switch is normally open Fingerprint module is set and when it is normally closed the PC is set to 1. Thus UART 1 is given for PC and Fingerprint module. UART 0 is for GSM and GPS.

For every increase in passenger, the count of IR sensor is checked. Whenever the passenger count exceeds maximum (say 60), the condition $COUNT < 60$ becomes FALSE and the ignition is stopped by setting LOW to the relay that is connected to the I/O pins of PORT C. Thereby the vehicle stops preventing any careless accidents happening. Only when the condition becomes TRUE the vehicle starts.

Further the accident alert system is performed with the help of GSM and GPS module. The vibration sensor is connected to I/O pins



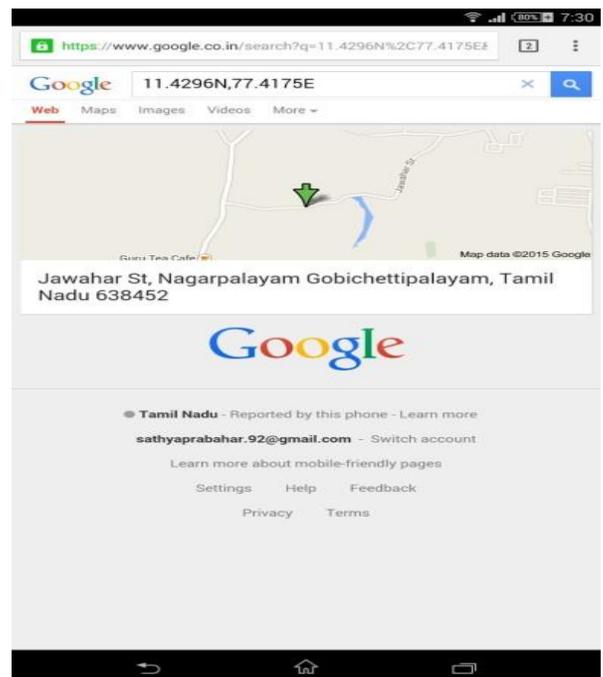
automated system that requires no interaction with the driver.

4 BLOCK DIAGRAM

FIG.2

5 WORKING

The database and the account details of the passenger are stored in the personal computer using Visual Basic. The program is coded for it displaying the characters such as name, account number, source, destination, avail balance, debited amount. The database holds the biometric information of the passenger, blood group, bank details and the trusted contact details. Initially, the fingerprint is scanned with the help of the fingerprint module at the entrance of the



of PORT C with the help of RS232. Whenever the vibration occur the control is given to the GPS module that searches the location of the vehicle and the GSM sends a message containing a link of the location of the accident spot to the emergency , nearby control room and the trusted contacts of all the passengers whose fingerprint are in access mode.

The link contains the latitude and the longitude of the location and once the link is clicked, the Google map will be opened with the exact location.

On the completion of the travel when the fingerprint scanned again, the ticketing control is stopped and the ticketing cost is debited from the corresponding bank accounts. Further the duration, distance and the cost for the last travelling are send as a message to the passenger through GSM module.

Thus any new passenger can be enrolled in the system by prepaid system. Wherein, the submission of the biometrics has to be made as a similar process that is carried out for the Bus Pass system that is in process.

Thus this proposed method is a completely man power limited that would be an excellent replacement to the existing traditional ticketing system. This approach would certainly save the fellow lives of passengers at emergency time through proper intimation about the accident.



The simulation for the fingerprint based system as well as the accident alert systems are performed in MPLAB software, AVR is used for programming. The bank account details is made and executed by using VB dot net. The simulation has ended up with accurate results.

6 CONCLUSION

Implementing embedded in such intra network communication systems will be a better way in the modern transport. In future Image Processing can be included for passenger counting in case of IR sensor.

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