© 2018 IJSRST | Volume 4 | Issue 5 | Print ISSN: 2395-6011 | Online ISSN: 2395-602X
Themed Section: Science and Technology

Passenger Identification System Using Iot Based Transportation Smart Card

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ABSTRACT

In many countries, Public transport is being used as a means of transportation for traveling. The most widely used public transport system is the bus transportation. According to many surveys, people prefer for proper and worthy public transportation facilities. Particularly in congested metropolitan cities, accidents are happening due to improper bus transportation. Also, vast number of thefts and other criminal activities are also happening in the same. The objective of our work is to identify the passengers traveling in the bus by collecting their database which will be stored in the centralized server of transportation department. For this purpose, we have implemented transportation smart card technology for database collection. The data about the passenger will be sent to the transportation department server through a trending technology known as Internet of Things (IoT). By using the database, we can easily find out the passengers who are suffered in accidents and also to identify the passengers involved in any theft or other criminal activities. The transportation smart card will be used for passenger identification, secured transportation and cashless transactions. From this method, we can achieve potential and efficient mode of public transportation using smart card because of its usability, practicality and versatility.

Keywords : Public Transportation Management System, smart card, Passenger identification, IoT, Server.

I. INTRODUCTION

Public transportation management system is the major source of income for the government. The accident rate and the death rate caused by the bus transport can be minimized. Government did not give importance to the bus accidents in the past days, because in olden days the ratio of between number of bus available and the passengers was maintained equally [4]. But now-a-days, the bus accident rate and the death rate are increased to uncountable level due to the ratio inequality.

The loss of human life due to accident has to be avoided. In case, unavoidable serious accidents take place the process of identifying the people involved in that accident becomes complex to the government.

Each year 360 million passengers choose bus transportation to travel different places due to its low cost. A total of 28 million miles are travelled by bus passengers every year. More than 1 lakh 37 thousand passengers were dead in road accidents in 2017only. In bus accident every hour about 9 passengers die [5]. The graph for the accident caused by the bus with different vehicle is shown in Figure 1.

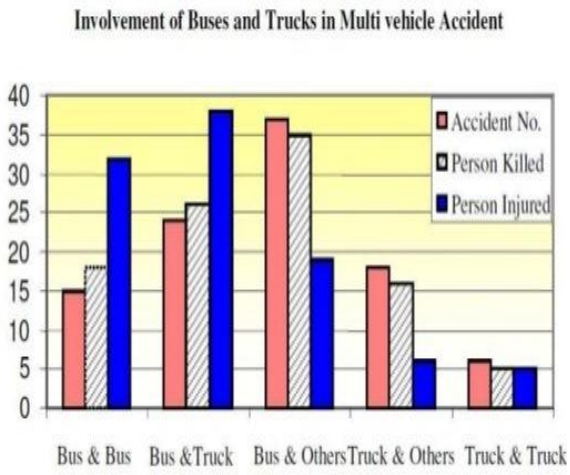

Figure 1. Graphical representation of Multi vehicle Accident

In 2017 the number of bus crash statistics rose slightly, as shown in Figure 2

- 257 fatal bus crashes.
- 49 bus occupant fatalities.
- 295 total fatalities in all bus crashes for 2017.
- 14,000 bus crashes resulted in injury.
- 53,000 bus crashes resulted in property damage only.

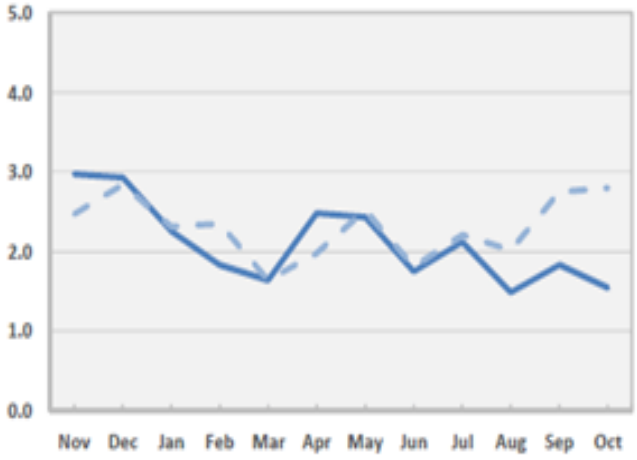

Figure 2. Bus Collision per 100,000 Miles

There were 888,907 buses and they travelled 16.2 billion miles during 2017.A breakdown of fatal bus crashes is as follows:

- ✓ Intercity buses –32 deaths.
- ✓ Transit buses and school buses –190 deaths.
- ✓ All the other types of buses – 35 deaths [1].

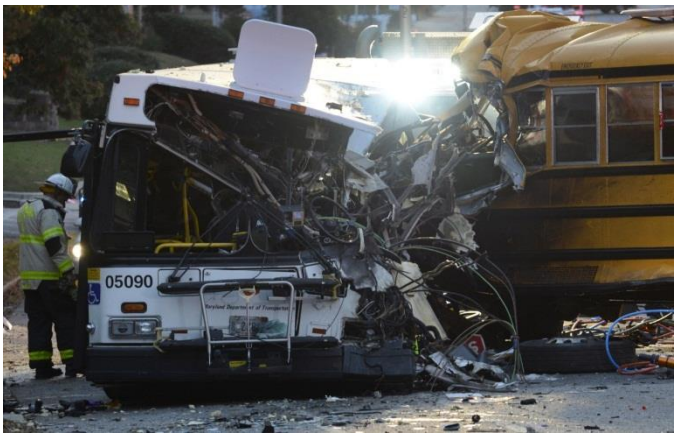

Figure 3. Picture of Accident between two buses

An example of recent bus accident is shown in Fig 3. Apart from accidents, the rate of theft and crime in bus is high. It is very difficult to find the passenger who involved in the crime activity [8]. It is a big process which is been followed now-a-days. Even, by following the big time-consuming process, the probability of finding the passenger who involved in the crime or theft activity is less and in most of the case it hasn't been identified. But, by using our methodology the identification of passenger who involved in theft or crime is easy and time taken to identify is being reduced for a large extend and the process is made easy.

This paper mainly focuses on three important objectives which are mentioned below,

- To reduce death rate due to bus accident.
- To identify people travelling by bus in case of accidents.
- To identify theft or crime while travelling in bus.

II. EXISTING SYSTEM

A Smart Card is a piece of plastic the size of a credit card that has a computer chip embedded on or in it. The card can be programmed to store data or information as well as to perform specific tasks. Smart cards have a greater use than other magnetic cards [6].

Smart card technology was first used in transport to improve the collection and apportionment of revenue from passenger fare payment. Most examples of smart cards in transport are still found in this area. 'Integrated payment' or the sharing of a common payment mechanism between operators has been

addressed by the public transport companies in order to offer the passenger a convenient way to pay for journeys which may involve travel with more than one operating company [6]. The smart card technology is shown in Figure 4.

Now-a-days, the data generated in cities can help to tackle some issues in big cities, such as traffic congestion, pollution and so on. Smart cards or city passes have been widely used in urban public transportation management systems. The smart card data are used in an increasing number of applications, including demand analysis, scheduling and so on. We survey the representative studies as follows which presented a method to estimate a public transport OD matrix. Ma *et al* proposed a Markov chain-based Bayesian decision tree algorithm to infer passengers boarding stops [7].

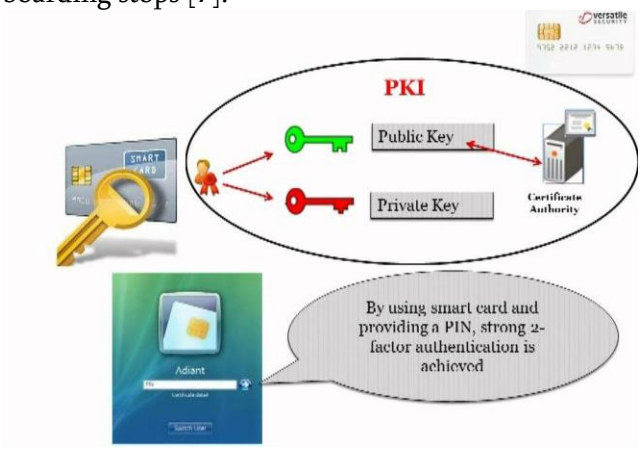

Figure 4. shows the smart card technology used

Smart cards have two basic types of interface to the world. They may be contact cards or contactless. Smart card with contacts has six or eight metal contacts on the card. Spring-loaded contacts on the reading device connect with each of these contacts. Cards must comply with the ISO standard 7816. They can be inconvenient to insert into a reader for applications such as boarding vehicles, paying for a fare at a barrier or toll-gate and the time required to complete the payment may be quite long - a few seconds [2].

GPS following for transports utilizes satellite innovation and advanced PC displaying to track transports on their course. Evaluated landing time of transport can be anticipated with outrageous precision, since gauges are continually being refreshed continuously. GPS transport following, which is another type of benefit following, is intended to enhance transport activities and help transport tasks chiefs by having a modern, easy to use apparatus to help in screen, overseeing, screen and revealing of transport armada data [3]. This sort of GPS tracker gives a "major picture" perspective of how your transports are being used. Above all, this vehicle following innovation uncovers steady calendar landing time weaknesses and in addition wasteful procedures. This encourages the chief to rapidly recognize issues and actualize upgrades. The existing system is shown in Figure 5.

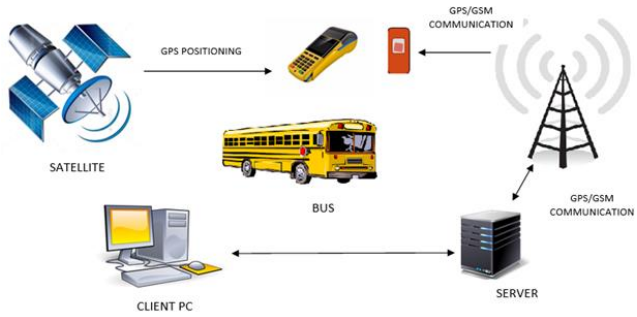

Figure 5. Bus tracking system Architecture

Now-a-days the identification of the people who are involved in the accident is a big process and the same process which is been followed for a very long year. They need a very long time to find the people involved. Recent days we can see that they take more than 2 days to perfectly identify the people involved, which is a very long time. In modern days we find different solution for different things, but there is very less invention that has been dedicated to the improvement for the transport system

Smart card is used most commonly for the digital payment implementation. It is used in the car and bike parking in malls now-a-days.

III. PROPOSED METHODOLOGY

In case of any accident occurred in the bus transportation the time taken to identify the passenger involved in the accident is too long now-a-days. The remedy for this problem is our methodology where we reduce the time taken to identify the passenger involved in the accident. The method followed at present is that when an accident occurs, the wound and injured passenger are taken to the hospital and in case if we want to identify the passenger involved in the accident then the passenger recovery is must to share their information and if any passenger dies in the accident then identification is done by the help of their relative. The relative of the passenger know about the accident only through social media which consumes much time for their reaction towards identification process.

By our methodology if the accident occurs we can easily identify the passengers by collecting the transportation smart card of the passenger. In case the transportation smart card is damaged we can retrieve the information from the server with the help of the ADMIN (Responsible person of the transportation department to maintain database of passenger).

A. Work Flow

Now we enter into our workflow, when the passenger enters into the bus and keeps the transportation smart card near the card reader during their entry time it reads the data and sends the passenger data with the entry time and location to the transportation department server through a technology called IoT. And when the passenger shows the card during their exit time the reader sends the exit time details and the location of the passenger to the transportation department server. We have used GPS to find the location of the passenger and bus. The work is shown in the Figure 6.

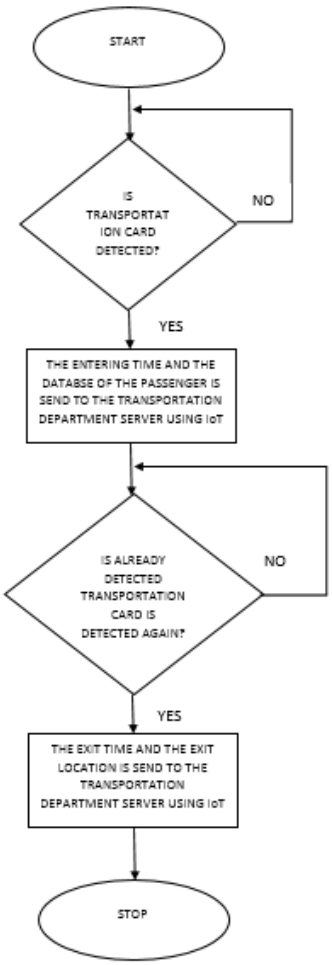

Figure 6. flow chart for sending the passenger details to the server

The accidents which occur due the bus transportation have to be avoided. The over loading and the distraction of the driver causes the accident, these errors can be reduced to a great extent by bring up new rules. In case of any accident occurs, our methodology helps passenger to get the needed medical treatment quickly compared to our present method. The method followed for providing the medical treatment to passenger now-a-days is, some people around the accident occurred area should call the ambulance and inform them about the accident. After that the passengers are taken to the nearby hospital for treatment and the hospital members are not aware of the count and they will not be ready to

treat all the people and they take time to arrange facility to all the passengers which consumes time.

The injured people have to be treated quickly based on the seriousness of the wound. The method followed presently can make way for death of passengers to certain amount. We are proposing a methodology by which the passengers are treated quickly. Now when the bus meets any sever accident the accelerometer (includes gyroscope, accelerometer, magnetometer) gives the stability of the vehicle; vibration sensor gives the vibration during the accident which will be helpful to identify the seriousness of the accident. The accident information is send to the transportation department server by the help of IoT. By receiving the accident message, the server sends the message to the nearby hospital, blood bank and ambulance by the help of the location send to it. This can save several lives of passengers. The flow chart of this method is mentioned in Figure 7.

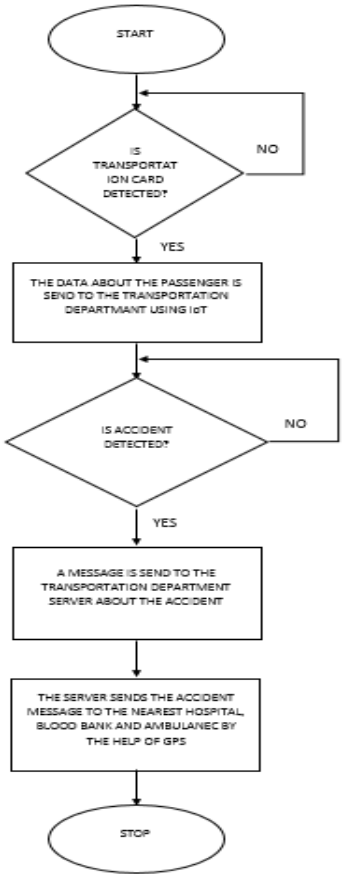

Figure 7. Flow diagram for the accident detecting and reporting methodology

B. Block Diagram

In our methodology our aim is to identify the people involved in the accident and to find the person involved in theft. We have used transportation smart card, which carries the information about the passenger and we have also used GPS tracker to track the location.

The Block diagram of Passenger identification and theft identification system is shown in Figure 8.

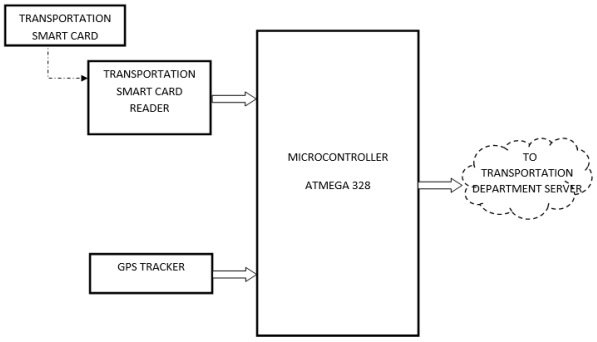

Figure 8. Block diagram of Passenger identification and theft identification system

We have also planned to send the details of the passengers to the nearby Hospital, Blood Bank and Ambulance. This will play a huge impact in saving the life of the people. The Block diagram for detecting accidents is as shown in Figure 9.

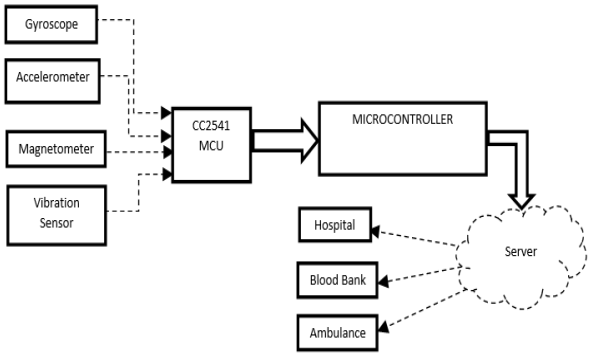

Figure 9. Block diagram for detecting accident.

Apart from identifying the people involved in the accident our methodology is also designed for theft

identification and crime activities identification. Now in case of theft or crime activities occurrence inside the bus the data of the passenger which is stored in the server is retrieved by the ADMIN (Responsible person of the transportation department to maintain database of passenger). By using the data retrieved we can find the passenger involved in the theft or crime activities. The data about passengers will be helpful for the police department or crime department to identify the passenger who involved in crime and theft activities within a short duration.

C. Components details:

- ✓ ATMEGA 328.
- ✓ TRANSPORTATION SMART CARD.
- ✓ GLOBAL POSITIONING SYSTEM.
- ✓ INFRARED SENSOR.
- ✓ ALERT SYSTEM.
- ✓ CC2541 MCU.
- ✓ ACCELEROMETER.
- ✓ GYROSCOPE.
- ✓ MAGNETOMETER.
- ✓ VIBRATION SENSOR.

ATMEGA 328:

The Arduino Uno is ATmega328 based microcontroller board. It contains everything which are needed to support the microcontroller, we can simply connect it to computer by using the USB cable or power it battery to get started. It gets the necessary data from the peripherals and worked on it.

TRANSPORTATION SMART CARD:

A transportation smart card is nothing but an security token that has an embedded chip inside. Transportation smart card which will be issued by the transportation department to the passengers and the card holds personal details of the passengers for identification purpose.

INFRARED SENSOR:

In our project we used IR sensor to count the persons entering and leaving to and from the bus respectively.

GLOBAL POSITIONING SYSTEM:

GPS is a tracking device which is used to track the location details of the bus and it send that information through IoT to the centralized control unit (transportation department server).

CC2541 MCU:

The CC2541 is a wireless Bluetooth microcontroller. It is a power-optimized true system-on-chip (SoC) solution for proprietary 2.4-GHz applications & for Bluetooth low energy.

ACCELEROMETER:

The 9-axis accelerometer (includes gyroscope-IMU3000, accelerometer-KTXJ9, magnetometer MAG3110) gives the stability, exact position and direction of a person.

VIBRATION SENSOR:

The vibration sensor (KG117) gives the data of the vibration during accident to the wireless Bluetooth microcontroller.

ALERT SYSTEM:

Here, the alert system is used update the current and next bus stops to the passengers for their comfort.

IV. CONCLUSION AND FUTURE SCOPE

The death rate due to the bus accident is pretty much higher now-a-days. The time taken to identify the passenger who involved in the accident is also too long. We know time is a precious one in the recent world, so we cannot tend to waste. So, in our methodology we can reduce the time taken to identify the passenger who involved in the accident by using the database of the passengers which will be collected through the passenger's transportation smart card .It is

easy to monitor the information of bus and passengers details in server via our methodology and it can be done only by the higher authority or by the person who is responsible for it, so the data's are very secured and it cannot be misused.

The theft and crime rates are also very serious. We need to reduce that too. Fitting the cameras in bus and monitoring passengers is a complex task and it requires more memory for storing images or videos and also camera need's extra power to run. But in our methodology, we will collect the passenger's database which requires very less space in the server compared to the previous method.

The IoT based transportation smart card which has been proposed by us will be rechargeable, so we can also use that for the ticket automation purpose which will reduce the ticket cheating, illegal travel of the passengers and it also reduce the loss for the government.

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