# Web Based Smart Volvo Bus Passenger Protection against Accident and Tracking Using Android Application

Muhammad Najmudheen C.P., Shamsul Hassan Roman, Shabnum S.N., Pallavi K.S.
U G Students, Department of Electronics and Communication
Rajeev Institute of Technology, Hassan

***Abstract:*** This paper conveys information of providing high range of security for Volvo buses including other heavy vehicles against accidents that may happen due to fire catching and accidents that may happen due to some obstacles. The vehicle will be fitted with the temperature sensor and IR sensor which will be continuously monitoring the temperature and obstacles that may come infront of the bus. In case of any fluctuation, the passengers and the driver are made alert and vehicle will be stopped automatically. The emergency doors and main door will be opened instantly so that the passengers can escape as soon as possible. The location of the vehicle will be tracked and sent to the control room and fire brigade authorities. An added advantage of the paper is the involvement of smart android application which will be updated with these scenarios. In case of any accidents or fire in the bus, the GSM module present in the bus will automatically send a message to the police station, fire station & ambulance for rescue operation along with the location with longitude and latitude values which can be tracked with the help of google map.

*****

## I. INTRODUCTION

Vehicle accidents are a leading cause of death. As the fuel tank in Volvo buses are very closer to the road, there is a high possibility of getting sparks in the tank and caught fire. In such situation the passengers may not be able to escape from the bus since there is no facility in the buses to alert the passengers who may be sleeping or else busy with their own work and do not know the problem until it reaches to the critical condition. Also, accident may occur due to careless driving. If any obstacles come infront of the bus which the driver has not notified about, it may lead to an accident.

If there is a convenient system that will automatically monitor the temperature level and obstacles infront of the bus we can avoid these problems to a great extent. This paper implements an embedded system which is used for preventing Volvo busses against fire and accidents, tracking and positioning of the vehicle by using Global Positioning System (GPS) and Global system for mobile communication (GSM). Automated vehicle accident detection can save lives by decreasing the time required for information to reach the emergency responders.

Conventional vehicular sensor systems for accident detection, such as OnStar, notify emergency responders immediately by utilizing built-in cellular radios and detect car accidents with in-vehicle sensors, such as accelerometers and airbag deployment monitors. Figure 1 shows how traditional accident detection systems operate.

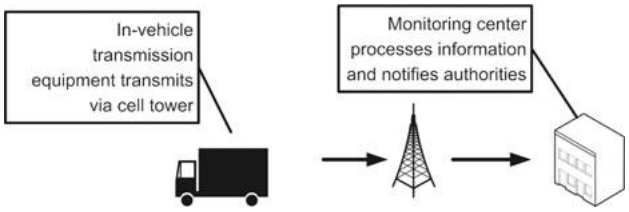


**Figure 1**: A Traditional Accident Detection System

Recent advances in smart phone technologies are making it possible to detect car accidents in a more portable and cost effective manner than conventional in-vehicle solutions. Smartphone-based accident detection applications provide several advantages relative to conventional in-vehicle accident detection systems, *e.g.*, they are vehicle independent, increasingly pervasive, more efficient. Hence building a smart phone based accident detection system yields more efficiency than a conventional in-vehicle system. Hence such a system can be used to get help to the victims in a more efficient way.

In order to avoid the accidents of bus including other vehicles due to fire catching or obstacles, the vehicle will be fitted with the temperature sensor and IR sensor which will monitor the environment of the vehicle, and the Buzzer to alert the passengers if critical conditions occur. The involvement of smart Android application in the model which can be installed in Android mobile phones is an added advantage. In case of any emergency situation in the bus, the bus will send an SMS to the emergency responders regarding the emergency condition along with the location. Using this SMS the android application will be updated with the condition. Also, anybody who wants to know the exact location of the bus can fulfill their need within seconds by means of this smart android application. The GPS system

used in the network will get the location of the bus and the GSM system will automatically send alert messages to nearby police station and fire station which will enable the victims to get help within a short span of time. The goal of this paper is to design a system that would avoid accidents in embedded environment and to alert the passengers if the accident occurs. The nearby police station and fire station must get alert about the accident as soon as possible to get help to the victims at the correct time. The huge loss that may happen to the vehicle and to human lives by the accident can be avoided to a greater extent. Any person can locate the vehicle by means of this system.

## II. VOLVO BUS TRACKER AND ACCIDENT AVOIDER SYSTEM

The system used for the detection and tracking of the Volvo bus is shown in Figure 2 in which various components required for the implemented system can be seen. The processor controls and coordinates the operations of the other functional units. The power supply is given to the system according to the specifications.

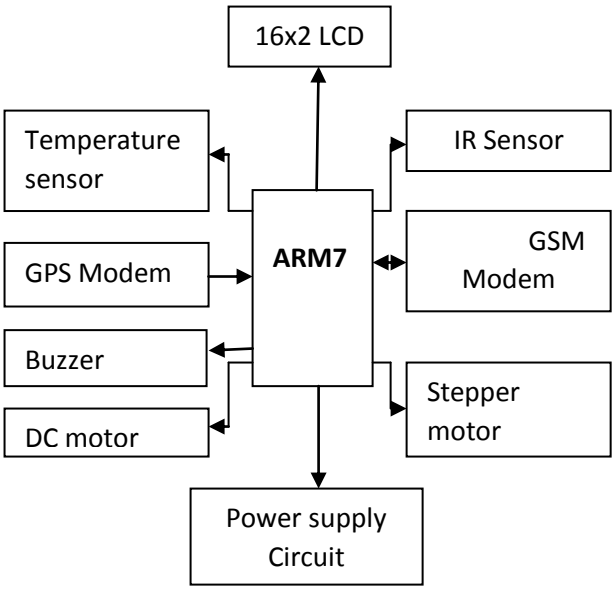


**Figure 2**: Block diagram of GSM and GPS vehicle tracker and Accident Avoider System.

The implemented model has modeled using various components that are necessary to achieve the goal of the model. The code is written in the internal memory of Micro processor i.e. ROM. With help of instruction set it processes the instructions and it acts as interface between GSM and GPS with help of serial communication of processor. Along with this model an android application has also modeled for the ease of locating the vehicle. This enables the system to decrease the time required for information to reach emergency responders. The design and implementation of the implemented model can be explained by the use of a flow chart as shown in figure 3.

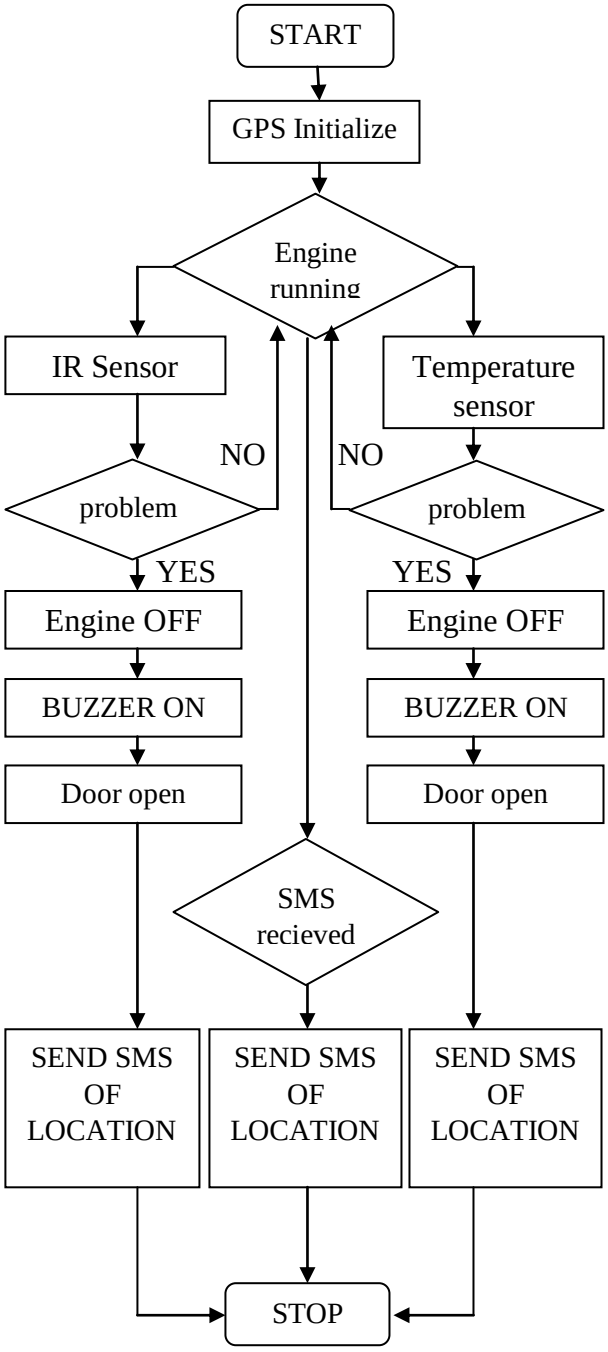


**Figure 3**: The flow diagram of the working of volvo bus model.

The implemented system for the Volvo bus tracking and accident avoiding system is designed to work as described in the flow chart given. The installation and implementation of each component into the system has to be carried out in such a way that it satisfies the operation as in the flow diagram. The components that are used in the system are described here.

**ARM PROCESSOR:**

The ARM processor receives the signals send by various components of the system and performs various actions which are required further by processing those signals. Fig 3.1 shows the ARM processor installed in the model.

**Figure 4:** The ARM processor installed in the model

The ARM processor sends signals to various components required to control them.

**DC MOTOR:**

DC motor is connected to implement the engine of the vehicle. The motor will be continuously running to indicate that the vehicle is moving. The ARM processor will control the DC motor via the relay. The relay is a digitally operated switch. The inter connections in the relay are controlled by using digital signals. According to the input digital signal it receives, it selects the interconnection. On the output side of the relay unit there are 3 pins namely C (Common), NO (Normal Open) and NC (Normal Close). The NO pin is connected to the input terminal of the DC motor. The common pin of the relay is connected to the ground. If the relay receives logic 1, then the NO and C pins will be shorted internally and if the relay receives logic 0, then NC and C pins will get internally shorted. Figure 5 shows the DC motor installed to represent the engine of the bus.

**Figure 5**: The DC motor connected in the model

At the beginning the processor will send a logic 1 to the relay so that the NO and C pins will be shorted and the motor connected across these pins starts running indicating that the vehicle is moving. During emergency condition, the vehicle has to be stopped automatically. In such situations, in order to stop the DC motor, the processor sends logic 0 to the relay so that the connection inside the relay will change and motor stops.

**BUZZER:**

The buzzer is the alarm system used to alert the passengers in emergency situations. The Figure 6 shows the buzzer connected in the model.

**Figure 6**: The buzzer connected in the model

If any emergency condition occurs, the processor will send logic 1 to the processor so that the buzzer will be switched on and sounds alarm.

**SENSORS:**

Two sensors are used in this model, the temperature sensor and the IR sensor. They are used to sense the temperature inside the bus and the obstacles that may come across the vehicle respectively and send the feedback to the ARM processor. If the obtained temperature value exceeds the predefined value, then it is considered as an emergency situation. There will be two LED's in the IR sensor among which one is a transmitter and the other one is the receiver. The signal transmitted by the transmitter will get reflected from the obstacle if there is any, and will be received by the receiver LED. If the receiver LED receives a reflected signal it will send logic 1 to the ARM processor.

**STEPPER MOTOR:**

The stepper motor in this model is used to make the emergency door of the vehicle open automatically in emergency situations. After the bus has stopped automatically and the buzzer sounds the alarm, an efficient way for the passengers to escape from the vehicle is necessary. So the emergency door is controlled by the stepper motor here. Figure 7 shows the stepper motor used in the model.

 ISSN: 2321-8169
2659 - 2665

**Figure 7**: The stepper motor installed in the model

Total 52 steps are required for the stepper motor to implement a complete rotation. For the emergency door to be opened, it is required only a 45 degree rotation which can be implemented by 13 steps in the stepper motor. The stepper is controlled by the driver unit ULN2003.

**GPS AND GPS MODULES:**

The GPS and GSM modules are used to track the location of the vehicle and send SMS of alert and location to the emergency responders respectively. Figure 8 shows the installed GPS module.

**Figure 8**: The GPS module installed in the model

The location information which has tracked by the GPS module, consists of the longitude and latitude values, should be sent to the emergency responders along with an alerting sentence by the GSM module in order to get the help as soon as possible. Figure 9 shows the installed GSM module.

Figure 9: The GSM module installed

A SIM card will be inserted in the GSM module using which the GSM module send and receive messages.

**ANDROID APPLICATION:**

The android application is used to get the correct location using the longitude and latitude values which would be sent by the GSM module. Anybody who have installed this application in their android mobile phones and knows the particular GSM module number can get the location of the vehicle at any time. The option to register the GSM module number in the application is shown in Figure 10.


**Figure 10:** GSM module number registration in the android application

The GSM module number is entered and click on 'Register' icon on the screen. If the number has registered successfully then a command "Number has Registered Successfully" will be shown. Once the number has registered successfully, the text message from that particular number would get the application open automatically and the longitude and latitude values which will be present in that text message would be fetched by the application. The application will perform some algorithms using these values and it will show the exact location with the help of google map.

## III. EXPERIMENTAL RESULTS

When the bus engine is started by the driver, the device automatically turns ON and all the components will begin to function automatically. The LCD which has fixed near the bus driver will keep updating the status of the bus as well as the sensors at regular intervals. As soon as the bus

 ISSN: 2321-8169
2659 - 2665

starts moving, the LCD has displayed the command as shown in Figure 11.


**Figure 11:** Experimental output while bus is moving normally

The emergency situation may be of a fire detected in the vehicle or may be of an accident occurred.

**CASE 1: Results for high temperature**

When the temperature is increased above the pre defined temperature cut off, the temperature sensor sensed this temperature rise and the processor got notified. Then the ARM7 sent a message to LCD to indicate that there is a rise in temperature. The message displayed on LCD in case of a high temperature is sensed by temperature sensor is as shown in the figure 12.

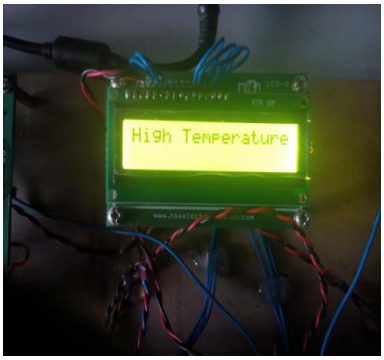


**Figure 12:** Experimental output when temperature is high

Now the location values which have been tracked and stored by the GPS module is sent to the pre defined emergency responders in the form of a text message by means of GSM module. Figure 13 shows the text message that is received from the GSM to the pre defined numbers.

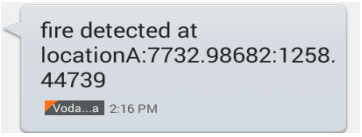


**Figure 13:** Experimental text messages received

In the text message, the longitude and latitude values which had tracked by the GPS module can be seen. These values would be fetched by the android application. As soon as the text message is received, the android application which has installed in that mobile is opened automatically. Now the application shows the particular notification message as per the situation. Figure 14 shows the notification message which is shown in the application in case of rise in temperature.


**Figure 14:** Experimental output shown in android application

In addition to the notification sentence a selection option labeled as "View MAP" is given in the application. By clicking on this option the exact location of the vehicle is shown by the application by redirecting to the google map. Figure 15 shows the location shown in the mobile with the help of google map.


**Figure 15:** Experimental result of exact location by application

By using the map the emergency responders can reach the location as immediate as possible and this helps the victims to get help at the correct time.

**CASE 2: Results for obstacles sensed**

The case of accident is discussed here. The obstacle that comes across the vehicle is considered as the accident. The IR sensor will be monitoring the obstacles in front of the bus by radiations emitted through the transmitter LED. If any obstacles come across the vehicle, the reflected signal from the obstacle is received by the receiver LED and this indicates the obstacle.

The ARM processor will count the presence of obstacle continuously. As soon as the sensor detects the obstacle for the first count, the processor will give an alert to the driver by means of LCD display and buzzer. The obstacle detection at the first count is considered as a chance of accident. Figure 16 shows the experimental LCD display for the same.


**Figure 16:** Experimental output in LCD

The same operation happens if the sensor still detects the obstacle for the second count. If the obstacle still present there at the continuous third count and the driver has not stopped the bus yet, then it is considered as an emergency situation. The processor will stop the engine automatically, switch on the buzzer and sent SMS of location to emergency responders. Figure 17 shows the SMS received by emergency responders in case of an accident.

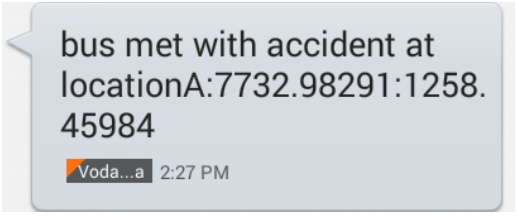


**Figure 17:** Experimental text messages received

Figure 18 shows the android application notification in the case of accident.


**Figure 18:** Experimental output shown in android application

The same procedures after receiving the SMS as mentioned in the case 1 are come in effect in this case also. The android application will fetch the longitude and latitude values and gives the exact location by means of google map.

## IV. CONCLUSION

This paper has provided an efficient system for passenger safety by detecting accidents and tracking vehicle using android application. In the model the hardware part, software part and the android application are developed and verified according to the expected results. The proposed system stands as a very helpful system in avoiding the huge loss that may happen due to accidents. This model can also be used in other vehicles other than Volvo bus.

The main contribution towards the success of the detection is that the use of android application which enables the exact locating of the vehicle. In future the model can make more helpful by using more efficient sensors and modify the android application by including more features.

## V. ACKNOWLEDGEMENT

The authors would like to convey heartfelt thanks to Mr. **Yashwanth N**, Assistant Professor, Dept. of ECE, Rajeev Institute of Technology, for providing valuable assistance and guidelines to make this work meaningful.

## REFERENCES

[1] Chris Thompson, Jules White, Brian Dougherty, Adam Albright, Douglas C. Schmidt, "Using Smartphones to Detect Car Accidents and Provide Situational Awareness

to Emergency Responders," LNICST, Mobile ware 2010, pp.29-42, 2010.

[2] Ch. ChakradharaRao, P. Pushpalatha, N. AdityaSundar, "GPS Based Vehic le Navigation System Using Google Maps," International Journal of Computer Science and Information Technologies, Vol. 4 (6), 2013, 979-982.

[3] V.D. Park and M.S. Corson, "A Highly Adaptive Distributed Routing Algorithm for Mobile Wireless Networks," Proc. IEEE INFOCOM '97, 1997.

[4] P. Levis et al., "TinyOS: An Operating System for Wireless Sensor Networks, Ambient Intelligence, Springer-verlag, 2005.

[5] Molla Shahadath hassain lipce, Md.Lushamur Rahman, Tahia FahsinRasim, Faria Sultana, "wireless security control system sensor network for smoke and fire Detection," 2010, IEEE.

[6] Abrach H, Bhatti, Carlson, J., Dai, H., Rose, J., Sheth, A., Sheecker, B., Deng, J. and Han, R. 2003 mantis: "system support for multimodal networks of in-site sensors," In Proc. Of the 2nd ACM int.cof.on wireless sensor network and applications.

[7] F. Salvadori, M. de Campos, PS. Sausen, RF. De Camargo, C. Gehrke,C. Rech, MA. Spohn and AC. Oliveira, "Monitoring in industrial systems using wireless sensor network with dynaic power management," IEEE Trans. Instrum. Meas., vol. 58, no. 9, pp. 3104-3111, Sep. 2009.

[8] I. Y. Onel and M. Benbouzid, "Induction Motor Bearing Failure Detection and Trans. Diagnosis: Park and Concordia Transform Approaches Comparative Study," IEEE/ASME Mechatronics, vol. 13, no. 2, pp. 257–262, April 2008.

[9] W. Wang and O. Jianu, "A Smart Sensing Unit for Vibration Measurement and Monitoring," IEEE/ASME Trans. Mechatronics, vol. 15, no. 1, pp. 70-78, Feb. 2010.

[10] J. M. Corchado, J. Bajo, D. I. Tapia, and A. Abraham, "Using heterogeneous wireless sensor networks in a telemonitoring system for healthcare," IEEE Trans. Inf.