

# Accident Prevention in AC Bus Using Temperature and Ultrasonic Sensor

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**Abstract**— A rapid increase in population has also led to growth in technology. People use a large number of transportation facilities and number of accidents taking place is also increasing day-by-day. Focusing on the bus accidents, they mainly happen because the minimum distance between two vehicles is not maintained on road and fire accidents in AC bus is due to short-circuit and passengers being in a different compartment in AC bus become helpless and can't escape, they get injured badly and die. Keeping this in view, this is a DIY set up project which monitors and records data through sensors for measurement of temperature and distance preventing mishaps from happening and to save people's lives. DHT11 sensor is used to sense the temperature rise inside the vehicle due to any mishaps like short circuit or in the situations where engine has caught fire and ultrasonic sensor is used to measure or sense the distance between two vehicles and GSMSIM800A module alert the user via SMS.

**Index Terms**— Arduino UNO, DHT11 sensor, Ultrasonic sensor, GSMSIM800A module and breadboard

## I.INTRODUCTION

Road traffic crashes result in the deaths of approximately 1.3 million people around the world each year and leave between 20 and 50 million people with non-fatal injuries according to World Health Organization. Most vulnerable are the younger generation and deaths & injuries involve vulnerable road users, such as pedestrians, cyclists and motorcyclists and their passengers.



**Fig. 1: The number of fatal accidents occurred from year 2016 to 2021**

Road crashes due to buses is when the minimum distance between the bus and the vehicle in front is not maintained at all times and fire accidents in AC bus is due to short circuit. Passengers will be unable to save themselves in a fire accident. Fig. 1 shows the number of fatal accidents occurred from year 2016 to 2021. According to the data over thousands of people have died in bus accidents every year in the country.

In addition to the human suffering caused by road traffic and fire accident injuries, they also incur a heavy economic burden on victims and their families, both through treatment costs for the injured and through loss of productivity of those killed or disabled. More broadly, road traffic injuries have a serious impact on national economies, costing countries 3% of their annual gross domestic product.

Coming to fire accidents in AC buses, it is more frequent in India than in any other country. In AC bus, the driver's compartment will be at the front and will not be having AC in most of the cases. Moreover, during night time AC bus (especially sleeper coach bus) due to short-circuit catches fire. Many fire accidents have been recorded like this till date.

Since, all the passengers will be sleeping during night time and due to late realization, the fire will spread immediately and blocks all the way out to escape, which is the main reason for the deaths. Driver is the only person who is awake at this time but he'll be in a different environment. His cabin will be at the front so he'll not be able to sense the fire immediately. Using sensors, the driver can be alerted. Keeping all of these points in view, this project has been designed using DHT11 (temperature sensor), ultrasonic sensor and GSMSIM800A module which prevents such mishaps from happening. Temperature sensor (DHT11) will sense temperature and when it crosses a threshold value it will alert the user via SMS through a GSMSIM800A module. Similarly, ultrasonic sensor will sense the distance between two vehicles and when it crosses a certain threshold value it alerts the user via SMS through GSMSIM800A module.

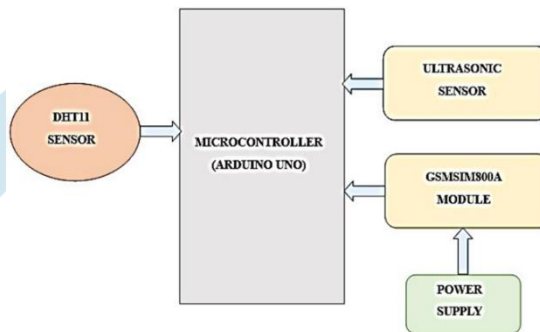
The codes developed are made to run in Arduino IDE software and dumped in Arduino Uno board. This way the project has been designed to prevent accidents from happening in an AC bus. This system consists of various units as shown below which are assembled as a whole and works in rhythm for accurate analysis functioning. As this system is equipped with highly sensitive sensors it is highly reliable for any application.

## II.OBJECTIVES

The aim of this project is to prevent AC bus from accidents by continuous monitoring using temperature and ultrasonic sensor and to save people's lives.

1. It alerts the user via SMS through GSMSIM800A module when the temperature crosses certain threshold value and prevents accidents.
2. It detects/senses the distance between the bus & the other vehicle and alerts the user when it crosses certain threshold value via SMS through GSMSIM800A module, which helps prevent accidents.
3. It makes it easier to communicate with user by sending SMS alerts to user's mobile phone, which helps the user in taking required further action needed.
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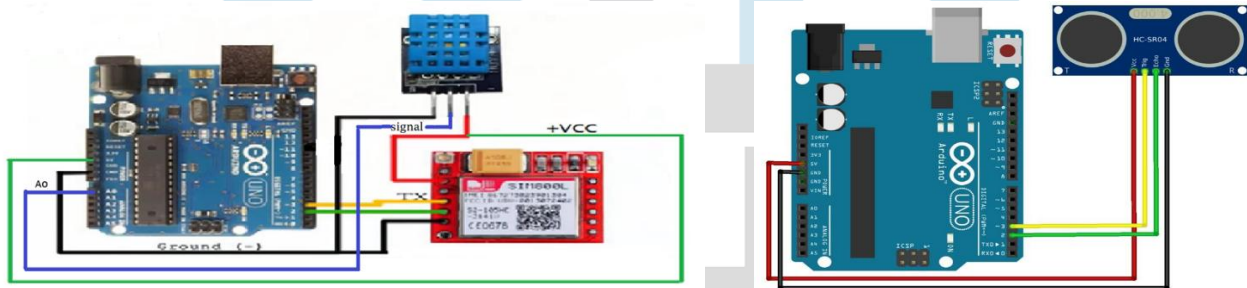
## III.BLOCK DIAGRAM AND DESCRIPTION



**Fig. 2: Block Diagram**

Fig. 2 shows the block diagram in which, the sensors used to measure are interfaced with Arduino UNO. Temperature is sensed by DHT11 sensor and distance is sensed by ultrasonic sensors. The source code dumped in Arduino IDE software will convert analog input to digital output. The GSMSIM800A module interfaced with Arduino receives the digital output and transmits the data to the mobile device. This gives the required information to the user.

## IV.CIRCUIT DIAGRAM



**Fig. 3: Interfacing GSM and temperature sensor with Arduino**

**Fig.4 Interfacing ultrasonic sensor with**

Fig. 3, shows the circuit diagram of interfacing GSM and temperature sensor with Arduino. The DHT11 sensor is interfaced with Arduino by connecting its ground and VCC pins of the Arduino and its signal pin to pin 11 of the Arduino. GSMSIM800A module is interfaced to the Arduino by connecting its ground and VCC terminals to a common ground and VCC terminals of the Arduino and its transmission signal pin to pin 3 and receiving signal pin to pin 2 of the Arduino.

Fig 4 shows the circuit diagram of interfacing ultrasonic sensor with Arduino. The ultrasonic sensor's VCC and ground terminals are connected to the common VCC and ground terminals taken from Arduino on the bread board. Its trigger pin is connected to pin 3 and Echo pin is connected to pin 2 of the Arduino.

## V.WORKING PRINCIPLE

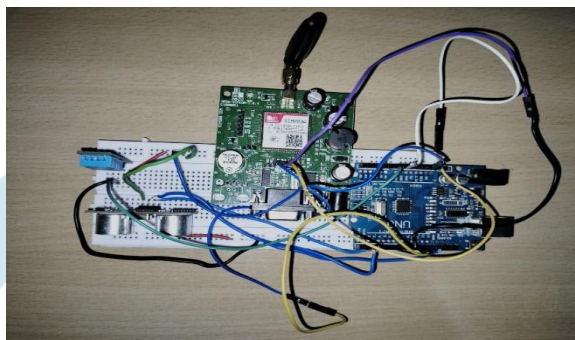
Initially, DHT11 sensor (temperature sensor) has been placed in the premises, where the monitoring is to be done and the ultrasonic sensor to measure the object distance. These sensors are interfaced with the Arduino UNO development board. The programming in the Arduino board will convert the analog output of sensor into digital form. After that, the digital information is given to the GSM Module which is interfaced with Arduino. The GSM Module will transmit the data to the Mobile device through SMS from the Arduino.

Additionally, a threshold temperature is set in the Arduino through programming which analyze if the temperature rises beyond that threshold, then automatically it measures to maintain the temperature that is taken by triggering and a warning SMS is sent to

the Mobile device. The Arduino and GSM shield are powered by DC Adapters/USB chords. Rest of all the components in setup are powered by the Arduino.

This work includes the development of a system, which gathers the temperature parameter in various premises through sensor which ranges from 0°C to 50°C respectively and the ultrasonic sensor will detect the object distance at the range of 0 to 450cm (4.5m) and sends the information. This system is modelled to a working platform with the help of the Arduino IDE software which is an open-source platform. The Arduino IDE allows you to implement the system coding in C/C++ and some other languages too, enables you to dump the code into the microcontroller and make your project come alive.

## VI.RESULTS



**Fig. 5 Complete working model**

Fig. 5 shows the testing of temperature sensor and ultrasonic sensor. Whenever the temperature increases beyond the threshold temperature the GSM Module sends SMS as “Temperature inside the vehicle has crossed the threshold, please check the System immediately.” to the specified number also whenever the object distance is less than 5 cm GSM Module sends

SMS as “Driver has been found of not maintaining the Preferred gap between the vehicles. Life is Precious, maintain the distance”. If the vehicle is safe then GSM sends a safe message.

## VII. DISCUSSION

The present work is one such simple approach to build a model for accident prevention in AC buses. This project will alert the user when there is a rise in temperature inside vehicle and also when the minimum distance is not maintained. It basically provides prevention and alerts the user via SMS using a GSM module before the mishap. It is designed to help and save people’s lives.

## VIII. CONCLUSION

The present proposed work was a success and it will provide a convenient method for effective monitoring of vehicle’s confined environment such as sensing temperature and helping in maintaining a safe distance between vehicles in real time. This system is compact to an extent and cost effective when compared to prices of instruments used to measure the environmental factors. From the above analysis, it is ensured that it gives an accurate data as well as to avoids many hazardous issues.

## IX.FUTURE SCOPE

In future, this setup can be made more feasible for sensing temperature, humidity and distance. Also, more sensors like alcohol sensor which can be used to sense alcoholic drivers, speed sensors which detects speed and smoke sensors which senses the smoke if any fire accidents take place unknowingly within the buses. By implementing this in all vehicles for extra prevention and caution upon more investment. This setup can be modified further by the addition of more sophisticated designs.

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