

Arduino Based Monitoring and Control System for Heavy Vehicles

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ABSTRACT

The aim of this paper is to design a system for detecting the leakage of fuel (i.e. petrol or diesel) and control the speed of the vehicle. The system is also extended to monitor the engine temperature and also to detect Metal if carried by the passenger in luggage or with him. The proposed system uses arduino to control actions like activating the buzzer, display the status to driver and send message to the control station(bus point) using the GSM Module.

Keywords :— Gas sensor, Temperature sensor, Metal detector and arduino.

I. INTRODUCTION

In the recent past, fire mishaps in vehicles due to fuel leakage have led to large number of casualties in form of human life and properties. Accidents in the heavy vehicles, like long distance travelling buses, may also happen due to over speeding of vehicle or engine overheating. There can be also some worst scenarios like hijacking or terrorist attacks [1][2].

The idea in the design proposed in this paper is to develop a system which monitor and present all the above mentioned scenarios. The status of these cases is also indicated to the driver and simultaneously the information is passed to the control station[3][4].



Fig. 1 Fire mishap of moving bus

In the proposed design, a monitoring system is developed in heavy vehicles to detect certain parameters which may lead to fatalities. The parameters verified are.

- fuel leakage in vehicle
- over heating of engine
- over speeding of vehicle
- metal in passenger luggage cabin
- metal carried by passenger into vehicle

The Statistics of the various types of factors leading to accidents on highways during 2003-2007 is illustrated in Figure 2 [5].

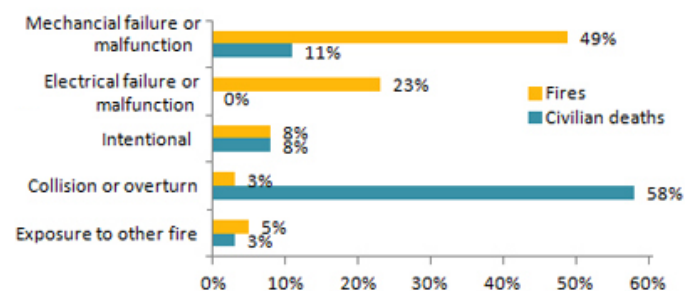


Fig. 2 Statistics of accidents in 2002-07

These parameters are monitored and controlled by arduino and if any abnormalities are detected then the buzzer is activated and the related problem is displayed on the LCD screen placed in the drivers cabin. The information is also simultaneously sent to the control center through GSM module. This instant information to the control center will help the maintenance guys at the bus point to send immediate

relief/rescue team and ensure safe travel of the passengers [6][7][8].

This paper is organized as follows. In the section II, the system architecture is explained. In Section III, the hardware implementation and the components used are discussed. In the final section, the designed system is discussed for its limitation and scope of improvement.

II. WORKING PRINCIPLE

Functionality of proposed work is divided into three stages. In the first stages, detection of fuel fume because of fuel leakage using gas sensor, temperature rise in engine and detecting metal in passenger luggage. In the second stage, control action by arduino when any one of the sensor gets activated, basically converting the analog inputs from sensors to digital form. In the third stage, the brakes are applied and the ignition is switched off to control the speed of the vehicle. The information is also sent to the control center simultaneously to the control centre by GSM module. The same information is displayed on the LCD display placed in the drivers cabin [9][10][11].

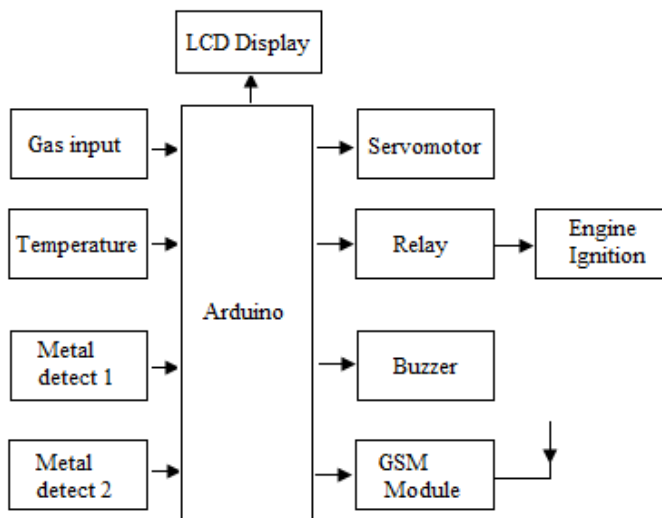


Fig. 3 Statistics of accidents in 2002-07

The functionality of each sensor will be explained in subsequent sections. In the initial stage, the arduino receives input signals from gas sensor, temperature sensor and both the metal detectors placed in different locations of the vehicle. The gas sensor gets activated due to the fuel leakage in terms of fuel fume. This fume may over heat the engine that may cause sparks. This heat produced by the spark is detected by temperature sensor. Similarly carrying of any kind of weapon in luggage or with the passenger is detected by the metal

detector 1 and 2 respectively. This is depicted in Figure 3 [12][13][14].

In this proposed work, Gas sensor will be placed inside the cabin i.e. above the engine mounted area. If the gas sensor is placed near engine it obviously will not give accurate data due to continuous fuel fumes. The Gas sensor plays major role, in case of fire, to alert the vehicle control station. In case the fuel fume is detected by the sensor, it will alert the passengers by activating the buzzer and display to the bus driver. But there are more chances to catching up of fire if the problem is not attended with in specified time. Hence, it will also alert the vehicle control station by sending a message through GSM module [15][16][17].

Temperature sensor will be placed near the engine cabin to monitor temperature. If the engine temperature raises above the rated value, buzzer will be switched on and will also be displayed on LCD screen. In case the problem is unattended the vehicle will automatically slows down and simultaneously the relay control will cut-off ignition. This action will avoid the subsequent actions like catching fire because of spark from the engine.

Metal detector1 is mounted inside luggage cabin to check if any passenger is carrying any kind of weapon in luggage. Similarly, metal detector 2 is mounted at the entrance of vehicle to monitor if any passenger is boarding the vehicle with a weapon. In both the cases. it will also the alert through buzzer and will display on LCD monitor [18][19].

III. HARDWARE IMPLEMENTATION

In this section, the hardware components used in the proposed design will be explained.

A. Gas Sensor

The Gas sensor is used to detect the fuel fume erupting out of engine. This sensor is connected to pin A0 analog input lines of arduino Uno. It requires input voltage of 5V. The sensor has high sensitivity to liquid petroleum gas (LPG), propane and Hydrogen and also has high sensitivity to methane, smoke and other combustible steam.

accidents are very frequent on National highways. This system can be further extended by placing few extra sensors like proximity sensors to avoid collision with other vehicles.

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