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DEVELOPMENT OF SYSTEM TO CONTROL SPEED AND DOOR UNLOCKING OF VEHICLE IN FIRE HAZARD

Mr. Bharti Shubham Bhaskar[1], Mr. Bhore Mayur Sanjay[2], Mr. Kulkarni Pranav Pramod[3], Mr. Magar Hrushikesh Sahebrao[4], Mrs. D. J. Ganore[5]

[1,2,3,4]Student, Mechanical, Shatabdi Institute Of Engineering and Research, Agaskhind, Nasik, Maharashtra, India.

[5]Professor, Mechanical, Shatabdi Institute Of Engineering and Research, Agaskhind, Nasik, Maharashtra, India.

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ABSTRACT

The safety of driver and passenger is very important in a vehicle. more than 2,000 vehicles aredamaged by fires every day, On a global scale. Main factor is the lack of fire safety system in automobiles. Due to unexpected fire driver and passenger get panic and they unable to rescue their self. If fire burn electronic and electrical system of door, then driver and passenger unableto unlock the door and driver loose control over the car that causes major injury to driver and passenger. So, we have designed the vehicle control system in case of fire hazard to turn on buzzer, control the speed of vehicle and unlock the doors to escape the driver and passenger. The project aim is to control the vehicle for saving the life or avoid major injury of driver and passenger by using various fire/smoke sensors at high-risk zone and by designing secondary control system for door lock and car speed. Developed system result in safety of driver and passenger.

Keywords: fire sensor, smoke sensor, door lock, fire hazard, safety

1. INTRODUCTION

The researchers are constantly working on fire protection in automobiles to prevent the injuries and deaths. In 2019 February, Dr. Omar Awan a 48-year-old anesthesiologist and father of five children was died when his Tesla model S car was crushed and got fire near Fort Lauderdale, Florida. A police officer arrived almost immediately after the crush. This officer and another person tried to open the door of the car and save the person but failed because of the door lock design of the Tesla. They could not get him out of the car. He died because of fire and inhaling smoke/toxic gases emitted from bonnet. In 2019 November two children were killed during a fire in Mercedes Benz G class (4x4) at Abu Dhabi. Two children left in a parked vehicle. A sudden fire incident occurred during that time.

Since the mother locks the door and left the car in the park, the people who saw the fire incident couldn't open the door of the car. Those children were trapped in the vehicle and burned. Three years old and one and half years old children died in that fire accident. There are so many other fire accidents happening all over the world; but these two are the mentionable and latest fire accidents occurred. Airbags can prevent the accidents by collision; in the similar way a permanent mechanism is necessary to stop the life loss by fire accidents.

A system which can detect and control fire is necessary in such situations. That system should be able to worn the driver, operates the fire extinguisher and unlock the door automatically. During an automobile fire, if there is a system to detect the fire and alerts the driver, then, the driver and passengers have chance to save their life from the fire. Also, there must be systems to operate the fire extinguishers automatically during automobile fire incidents.

Most of the automobiles have used fire resistant material to protect the passenger compartment from engine compartment, if there is any fire accident in the engine compartment. The fire in the engine compartment emits toxic gases which can cause breathing problems and sometimes even to fatal death. If the fire is to be prevented, then likelihood direction of propagation of fire and fire-resistant material in the location has to be identified. It can also be done by dividing the car into compartments like chassis, transmission and engine. To identify the right place of fire, the system has to be programmed separately for each compartment where fire can be expected. Because normally the engine compartment temperature is very high; so the temperature detection has to be programmed for every compartment separately. Even though the door of the vehicle can be opened manually, a person who trapped inside the vehicle fire, especially babies may not be able to open the door from inside. Because of inhaling toxic gases emitted from fire accidents, the driver or the passenger may be unconscious, and he too can't open the door sometimes. Breaking the window is also not possible all the times or it will take some time. So, a system to automatically unlock the door during a fire in automobile is suggested in this paper.

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2. METHODOLOGY

1. Concept Survey – In concept survey we first collect all the data related to our project from books, research paper. From this we know how much work is done related to ourproject.
2. Checking for Feasibility – In feasibility checking we understand various parameters related to our project like scope of our project and we think on each and every topic tomake our project feasible.
3. Project Selection - Our project is related to the safety of driver as well as passengers and we know that safety of driver as well as passenger in a automobile is one of the biggest challenge in front of automobile engineers so it will give a prime importance toour project.
4. Concept Development – After approval of our project from the project committee we are now thinking on the project concept and how we are going to work on it.
5. Data Collection – Data collection is one of the most important step in project making so for our project we collect various data from research papers, reference books and from our faculty.
6. Data Analysis – In these steps we segregate all the data and keep the important data which we collected for our project.
7. Concept Design- So after finalizing our project we now proceed to our project conceptdesign. In concept design we make a rough design of our project and what we are goingto make on a paper.
8. Final Design – After Approval of our rough project design by project committee we make a project design with the help of design software's like Creo parametric 3.0 and Ansys for phase 1 our project is completed up to the final design of our project

3. MODELING AND ANALYSIS

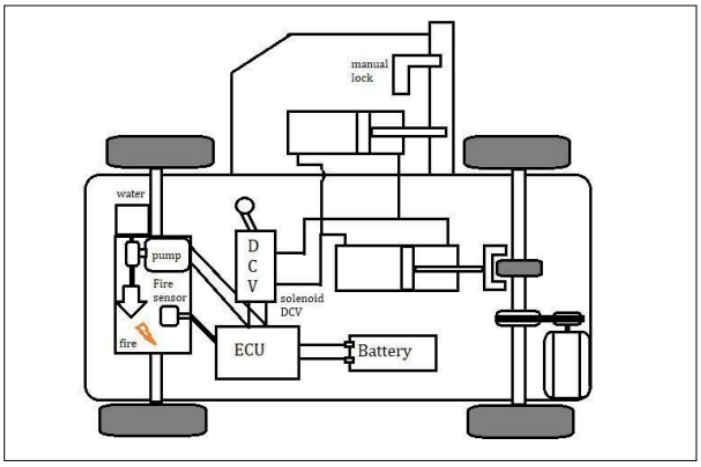

Figure1: Experimental Setup

3.1 Specification

a. The main component of the project is fire sensor has ranges 100 to 200 cm and it sense the signal and transfers to the electronic control unit then electronic control unit transfer the signal to the pump and pump the water from the tank to the place where fire hazard occurs.
b. Again electronic control unit sends the single to the solenoid valve it will open and close the air passage and allow pneumatic air to transfer to the cylinder one and cylinder 2.
c. Actuator one unlashes the door so passenger can easily escape from the car and save their life's.
d. Cylinder 2 actuates the brake lever then lever pushes to the piston has a friction pad, piston pushes the friction pad against the disc to reduce the speed of the vehicle.

4. RESULTS AND DISCUSSION

Table1. Response of servomotors according to sensor control

DHT11 temperature sensor	MQ2 Smoke sensor	Door Unlocking (SG90 Servo)	CO_2 Extinguisher (MG996R Servo)
38^0C <	400ppm <	Work	Work
38^0C <	400ppm >	Not Work	Not Work
38^0C >	400ppm <	Not Work	Not Work
38^0C >	400ppm >	Not Work	Not Work

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A major problem of automobile fire accident is discussed in this paper. Very recently, a terrific accident of Bus vs Jeep occurred in Oman Thai, Sri Lanka. 5 people killed and 21 got injured. It is mentioned in the news that the bus and jeep got fire after the accident and all who travelled in the Jeep were dead. It is claimed that the fire after the accident is the reason for the huge count of dead and injured people. This type of hazards can be solved by attaching the new system called automatic door unlocking system to the automobiles. A servo motor is attached on the door to open it based on required commands and another servo motor is attached to supply the fire extinguisher to the fire zone. There can be babies or even people who inhale the toxic gases due to fire and felt unconscious, trapped inside the vehicle. In such situation an external person can open the door comfortably from outside and rescue their life. Since this system has individual mechanism to unlock each door, there will not be any issue in opening the doors. The conditions to unlock the door and initiate the fire extinguishing mechanism are shown in table 5. Both the systems will work only if the temperature and smoke value are above the prescribed level. If only one condition fulfilled, the systems will not work. For example, the temperature alone may increase, if the vehicle is parked so long in sun light. The smoke concentration alone may increase if passengers inside the vehicle smoke cigarettes. But these two are not fire hazardous situations. This is why conditions are designed in a way that, both the sensors should show above prescribed values in order to operate the door unlocking and fire extinguishing systems.

5. CONCLUSION

At current scenario, the above mentioned system could be one of best fire emergency door unlocking system. It can be noticed from research papers that, there is no any mechanisms available so far to unlock the door during an automobile fire situation. In current scenario, a light shows an indication in dashboard, if any door is not closed properly in automobiles. Once all the doors closed properly the system will be locked by the driver before starting the vehicle. This is to prevent the exit of passengers without the knowledge of driver in any situation. At the same time it has a negative side also. If the driver didn't unlock the system under any hazardous situation, a passenger cannot open the door to escape. In case if the driver is the first person to die or to get unconscious, the life of all the passengers is in high risk. The above mentioned system is designed to address these issues. Even if the battery fails or the electrical system fails or the door locked manually, we can have a chance to rescue those who trapped in a fire. Since separate system is installed for each door, in case if the system of a particular door fails, the passenger can be saved by the other door.

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