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Implementation of Microcontroller Managed Module for Automatic Ventilation of Vehicle Interior and Fire Control

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ABSTRACT: Generally temperature inside the parked car can rise up to 30°C more than the outside temperature, thus during summer it can seriously affect the child or pet which had left inside the parked car. Even entering into such heated car is difficult exercise. Thus various systems were developed to provide proper ventilation for parked vehicles. These systems re-circulate the air once the interior temperature rises against the outside temperature. This paper review some of the current developed systems and tries to find is there scope for another efficient system. Review of different systems shows that there is scope for another simple, low cost system which will help to achieve proper ventilation system. The proposed system uses microcontroller and various sensors to achieve the objective. Sensors will provide the atmospheric conditions to controller then controller checks for uneasy condition inside the vehicle and if find so then will lower the windows for proper supply of air. Thus system can help to re-circulates air when needed.

KEYWORDS: Vehicle, Ventilation, Microcontroller, Gas sensor, temperature and humidity sensor; laser sensor, distance measurement sensor, obstacle sensor.

I. INTRODUCTION

A closed park vehicle has two problems. One, interior temperature of car can shoot up to 30° C higher than the outside temperature [1]. It is really dangerous in summer if we left child or any pet during summer season. Second, entering a parked car is difficult exercise because of the increased temperature. The main reason for increased temperature is due to conduction, convection and radiation [2]. However radiation is considered to be the main factor in such type of heating [3]. This variation in temperature depends on the thermal radiation exchanged between environment and body of the car [4].

One solution is to leave car's window partially open so that air can circulate. But, keeping window open without human presence is unreliable and unsafe. So it is desirable to develop a system which will automatically lower the window if the interior temperature exceeds the reference set of temperature. Also if any person comes near vehicle then system should shut the ventilation. A microcontroller based system is proposed which takes the input from temperature sensor and different other sensors like motion etc to process the interior condition of the vehicle. If the temperature inside the car is greater than the reference temperature then controller will lower the window so as to circulate the air inside the vehicle. That will help to maintain the interior of vehicle.

The Volatile Organic Compounds (VOC) such as formaldehyde, polybrominated diphenyl ethers (PBDEs) used in flame protections and phthalic acid esters (phthalates) which are from the materials used for the finishing of automotive parts such as plastics, wood, leather, textile, seat cushions, glues and sealants. Any passenger exposed to these substances can develop allergy and asthma symptoms and cause irritation in eye, nose and throat. It may result in cough, headache, general flu-like illness and skin irritation. These materials are having higher possibilities of causing cancer and neurological effects. Prolonged locked state of the vehicle from within will cause lack of oxygen supply and increase the levels of occupant causality [5].

The goal of such type of ventilation system is to take input from the sensors and operate ventilation of vehicle. The system must consist of different sensors like temperature and humidity. In the later years after independence the



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number of vehicles subsequently increased but in the last two decades it spreads drastically in every level of the society hence safety becomes the main concern. Road Accidents account a severe threat to the lives in both ways physical as well as financial, even after digital control of the vehicle [6]. However, due to human avoidance, circumstantial error and negligence accidents occur. Many people lost their life every year in vehicle collision majorly due to heavy pollution, fog, smog and low visibility. So, an observing real time problem, we also added sensor like laser, Gas and ultrasonic, By using this sensor we are able to measure air quality, visibility range to avoid the accident in real world.

In the system that must be capable of identifying the different parameters like real temperature, humidity, fog, smog and Air-quality. If so then microcontroller will command the motor to open and close ventilation of the vehicle. The data from all sensors is displayed on 16X 2 LCD provided for user interface. IR is used for security feature, can make the system efficient and help user to protect their vehicles.

II. RELATED WORK

NAME OF RESEARCHER: N Rajesh Reddy, K Venkatramana Reddy

TOPIC: Automatic Ventilation of Vehicle Interior Using ARM7

DATE OF PUBLICATION: 2015

METHOD: Rajesh Reddy et. Al. had developed an automatic system which will sense the environmental condition and operate windows for proper ventilation. System uses ARM microcontroller for more effective and reliable operation.

NAME OF RESEARCHER: K. Supriya and S. Ramkumar

TOPIC: High Secured Vehicle with Interior Ventilation Control And Perimeter Monitoring System

DATE OF PUBLICATION: 2015

METHOD: The system used ARM microcontroller, more feature were added to [3] system like humidity measurement and ultrasonic sensor These sensors were used for the advancement of vehicles. As soon as higher temperature is detected using temperature sensor then system with ARM processor will turn on the air conditioner. Also temperature sensor is well supported by the humidity sensor. Ultrasonic sensors are used to avoid the theft of vehicle.

NAME OF RESEARCHER: M F Basar, M Y Faizal, M Musa and NA A Razik

TOPIC: Alternative Way in Reducing Car Cabin Temperature Using Portable Car Cooling System (Car-Cool)

DATE OF PUBLICATION: 2013

METHOD: In this systems, the design and development of portable car cooling system. Their study indicated that the higher cabin temperature has made driver and passenger to feel more uncomfortable while entering the vehicle, especially for first 10 to 15 minutes Moreover, the vehicles cabin construction elements, especially fabrics would face early aging problem and may also cause damage to the goods stored inside the cars cabin.

NAME OF RESEARCHER: R. Saidur, H. H. Masjuki and M. Hasanuzzaman

TOPIC: Performance of an improved solar car ventilator.

DATE OF PUBLICATION: 2009

METHOD: According to the shocking findings of Saidur *et al.* very year many children die of (hyperthermia) heatstroke after being left unattended in vehicles in the USA. It shocking to note that the average number of children died of heat stroke was 29 persons per year in the year between 1998 to 2000. While in 2003 alone, this number increased to 42 and 35 persons in 2004. Annually, hundreds of children experience varying degrees of heat illness from being left in vehicles which are parked under the sun. Studies of Saidur *et al.* [13] Indicate that, cars need an auxiliary ventilation system to increase the air flow rate and decrease temperature inside the cars cabinet, their experimental results show a reduced temperature inside the vehicle compared to the non ventilated cabin.

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III. PRAPOSED ALGORITHM

BLOCK DIAGRAM

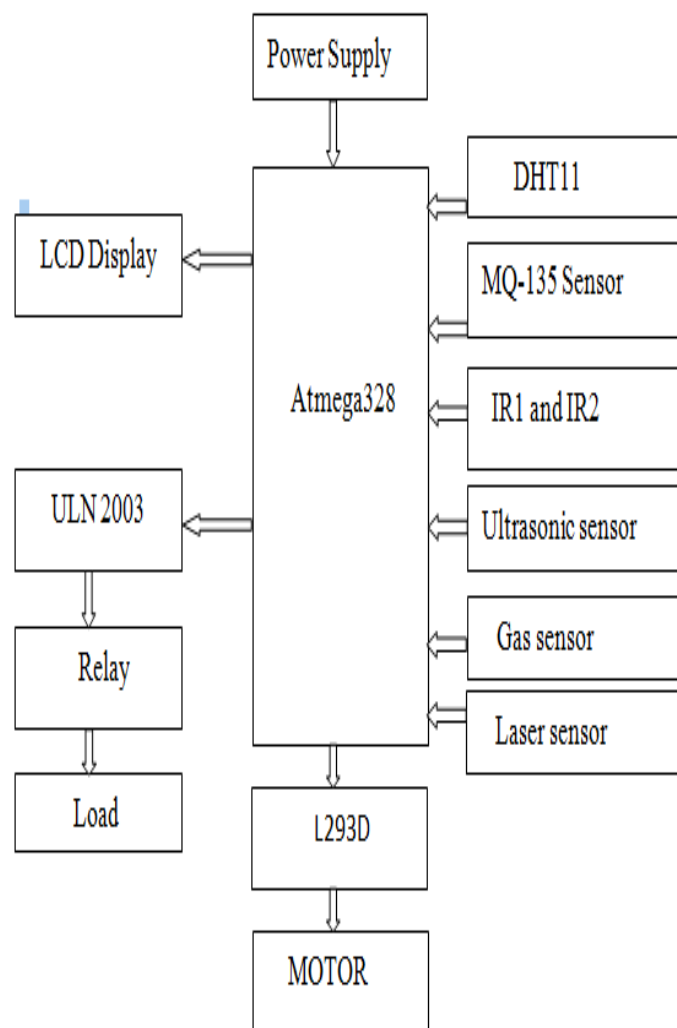


Fig.1: Block diagram of proposed system.

The block diagram of prototype is shown in figure1. The bridge rectifier is used to convert the 9V supply output of transformer into DC voltage. A voltage regulator IC 7805 is used to obtain fixed output voltage of +5V. Separate supply of same specification requirement is used for arduino module. The actuator used is L293D motor driving IC. The microcontroller used is ATMEGA-328. Temperature and humidity sensor module DHT11 is interfaced with arduino for sensing temperature and humidity and IR module is used as obstacle detector. L293D IC is used for dc motor driver to open and close the windows of vehicle. MQ135 sensor is used for different Gases for Visibility. LASER is used for FOG detection. Ultrasonic sensor is used for distance measurement.

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FLOWCHART:

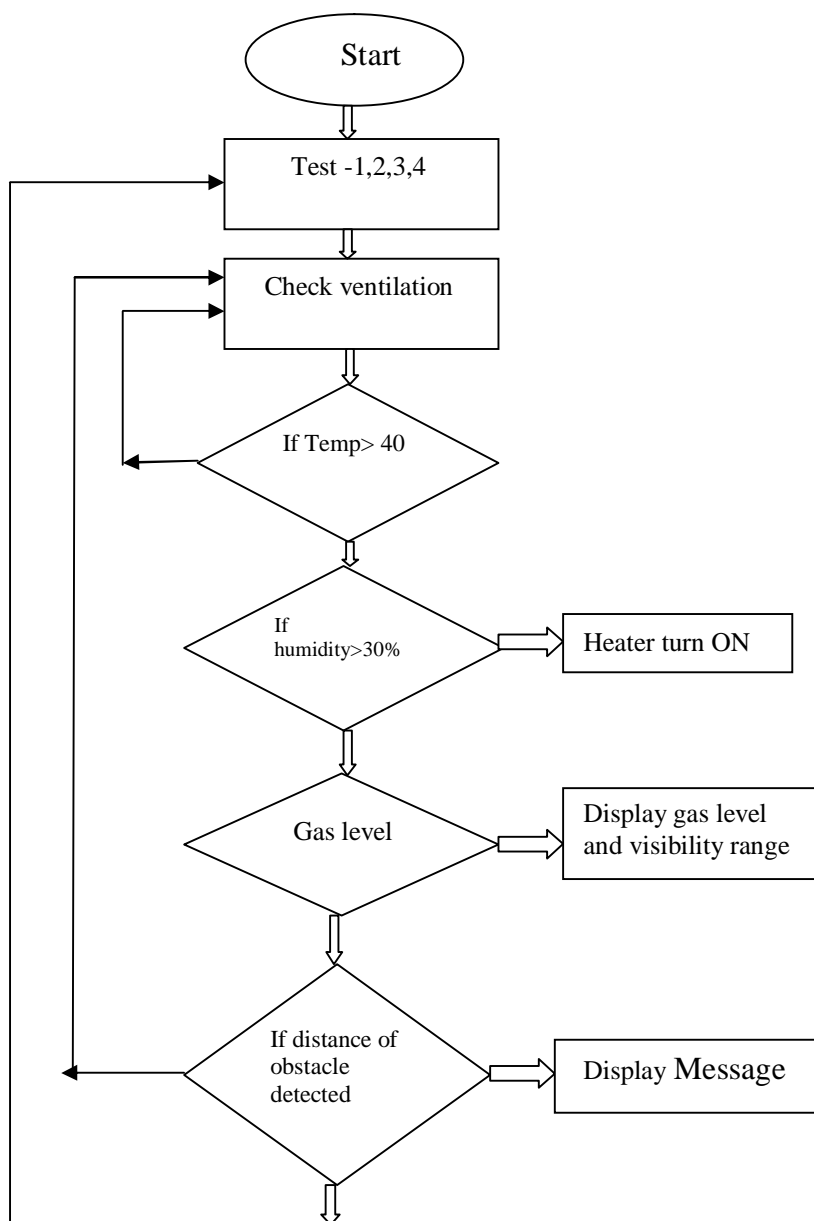


Fig.2: Flow-chart of vehicle ventilation system

Here, it is mentioned that a microcontroller decides what to do and operate independently. Method of operation can easily be noticed by the flowchart (fig.2). If vehicle parked, automatic mode on. when automatic mode is on, other preconditions are checked in order of priority; we will continuously monitor the temperature & if the temperature goes above the specified threshold value then, our system will activate the ventilation process. We will continuously display the current temperature on the LCD display. If temperature is less than specified threshold value then we check next condition, we will continuously monitor the humidity levels & if it goes above the specified threshold value then, our system will activate the heater for increasing the temperature. . We will continuously display the current temperature and humidity on the LCD display. Otherwise, we goes to next condition, we check gas level When the gas sensor

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detects the presence of gas, our system will analyse the gas levels present in the vicinity & will compare the detected gas levels with the standard values. Based on the comparison result, if the detected gas levels are LOW, then according to the Standard values we can suggest that the air quality is good. if the detected gas levels are HIGH, then according to the standard values we can suggest that the air quality is hazardous. Our system will display the result on arduino serial monitor. During ventilation process if any obstacle comes near vehicle then system should shut the ventilation and the result on LCD display. We are using ultrasonic & laser sensor for fog detection, we will display the result on LCD display.

IV. RESULTS

When the gas sensor detects the presence of gas, our system will analyse the gas levels present in the vicinity & will compare the detected gas levels with the standard values. Based on the comparison result, if the detected gas levels are LOW, then according to the standard values we can suggest that the air quality is good & the visibility range is near about 10 miles. Our system will display the result on arduino serial monitor.



Fig.3: Gas level and visibility range display on arduino serial monitor.

When the gas sensor detects the presence of gas, our system will analyse the gas levels present in the vicinity & will compare the detected gas levels with the standard values. Based on the comparison result, if the detected gas levels are HIGH, then according to the standard values we can suggest that the air quality is hazardous & the visibility range is less than 1 miles. Our system will display the result on arduino serial monitor.



Fig.4: Visibility range and Gas level display on arduino serial monitor

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If the IR sensor detects any obstacle near window, then our system will terminate the ventilation process & will also close the glass window. Our system will display the result on arduino serial monitor.



Fig.5: Obstacle detection monitoring on arduino serial monitor

Actual temperature:

DHT11 sensor will continuously monitor the temperature & if the temperature goes above the specified threshold value then, our system will activate the ventilation process. We will continuously display the current temperature on the LCD display



Fig.6: Actual temperature display on LCD Display.

Actual Humidity:

DHT11 sensor will continuously monitor the humidity levels & if it goes above the specified threshold value then, our system will activate the heater for increasing the temperature. We will continuously display the current humidity levels on the LCD display.



Fig.7: Actual humidity display on LCD Display



Fig.8: Humidity increases heater turned ON

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Air Quality:

When the gas sensor detects the presence of gas, our system will analyze the gas levels present in the vicinity & will compare the detected gas levels with the standard values. Based on the comparison result, if the detected gas levels are LOW, then according to the standard values we can suggest that the air quality is good. if the detected gas levels are HIGH, then according to the standard values we can suggest that the air quality is hazardous. Our system will display the result on arduino serial monitor.



Fig.9: Air Quality display on LCD Display.

Fog detection:

We are using ultrasonic & laser sensor for fog detection, we will display the result on LCD display.



Fig.10: Fog detection display on LCD Display.

V. CONCLUSION AND FUTURE WORK

It can be summarized that this module, although only a prototype, is completely functional device that performs its function safely, reliably and efficiently and avoid collision of vehicle. Possibility of application is not limited only to the vehicle ventilation. The module is extremely expandable in both ways: it is upgradeable for new tasks as well as compatible for integration into some existing systems. Nearly every component can be used for several other functions, which can be achieved only by software upgrade. Upgrading hardware opens even greater possibility to upgrade the software and there are countless capabilities. The system is implemented with simple devices to drive more comfortably in different environmental conditions.

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