Intelligent Diesel Gasoline Engine Protection System

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Abstract: This paper proposes a techniques of using in expensive automated preventive control system for problem caused due to engine overheating. System is integrated to present various other information to the operator, and can help prevent major failure.

The system consists of a controller mounted with LCD display and this project aims to identify failure of some parts of the vehicle like Break, Accelerator, Door lock, Clutch, Seat belt etc.viz. Immediately give a warning message to the user and to take the appropriate actions for preventing further damages. System can also be integrated as closed loop control system with an actuator to take preprogrammed actions like auto shutdown, radiator fan step-speed control etc.

The project is developed as a vehicular checking system and speed control is based on P89V51RD2 Programmed in embedded 'C'. This paper sho detailed of equipment and technique used to create such monitoring unit.

Keywords: Diesel Engine; Overheating, LCD, Failure, Accelerator, P89V51RD2 Embedded C.

I. INTRODUCTION

Essence of paper is to protect the engine from various calamities[1]. When any vehicle runs for long time the engine gets heated up beyond its critical temperature. The engine stops. It can be safe guarded by running the vehicle below its critical speed and switching on the fan to reduce the temperature of engine.

Even it identifies the failure of various parts of the vehicle like Brake, Accelerator, Door lock, Seat belt etc which should instantly send a message to the operator to take instant action to minimize the further damage to the engine. In long drive from place to the other place on highways, there are some speed limits for some areas. Many times, the vehicle driver may not notice these speed limits or even if he notices, he may ignore it. This results in increased number of accidents and other mishaps. The speed of vehicle automatically controlled using RFID technology[2,3].

II. BLOCK DIAGRAM

The essential concept of engine protection system is displayed in the block diagram. 80C51 Central Processing Unit and 5V being the supply voltages. The operating frequency from 0 to 40MHz. 64 kb of onchip Flash program memory with ISP (In- System Programming)and IAP (In-Application Programming).

Supports 12-clock(default) or 6-clock mode selection via software or ISP. SPI(Serial Peripheral Interface) and UART. PCA (Programmable Counter Array) with PWM and Capture/Compare functions. Four 8-bit I/O ports with three high-current Port 1 pins.

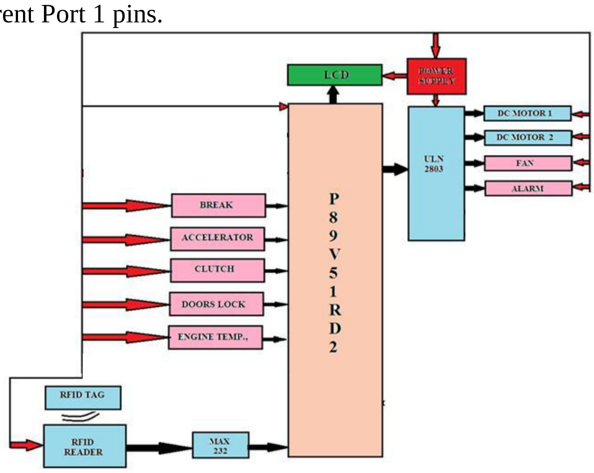

Fig. 1 Basic block diagram of engine protection system

A. P89V51RD2 MICROCONTROLLER

A P89V51RD2 is an 80C51 microcontroller with 64 kb Flash and 1024 bytes of data RAM a key feature of the P89V51RD2 is its X2 mode option. The design engineer can choose to run the application with the conventional 80C51 clock rate (12 clocks per machine cycle) or select the X2 mode (6 clocks per machine cycle) to achieve twice the throughput at the same clock frequency. Another way to benefit from this feature is to keep the same performance by reducing the clock frequency by half, thus dramatically reducing the EMI.

The Flash program memory supports both parallel programming and in serial In-System Programming(ISP). Parallel programming mode offers gang programming at high speed, reducing programming costs and time to market. ISP allows a device to be reprogrammed in the end product under software control. The capability to field/update the application firmware makes a wide range of applications possible.

The P89V51RD2 is also In-Application Programmable(IAP), allowing the Flash program memory to be reconfigured even while the application is running.

B. RELAY DRIVER(ULN2803)

A ULN2803 is an Integrated Circuit (IC) chip with a High Voltage/High Current Darlington Transistor Array. The ULN2803 comes in an 18-pin IC configuration and includes eight (8) transistors. Pins 1-8 receive the low level signals; pin 9 is grounded (for the low level signal reference). Pin 10 is the common on the high side and would generally be connected to the positive of the voltage you are applying to the relay coil. Pins 11-18 are the outputs (Pin 1 drives Pin 18, Pin 2 drives 17, etc.). Output Voltage- 50V, Input Voltage - 30V Collector Current – Continuous IC- 500mA. Base Current – Continuous IB- 25mA. Operating Ambient Temperature Range TA 0 to +70 °C. Storage Temperature Range Tstg –55 to +150 °C. Junction Temperature T 125 °. Typical uses are for micro-processor interfaces to relays, lamps, solenoids and small motors. A 2803 with a set of relays is a simple and effective way of switching mains voltages.

III. CIRCUIT DIAGRAM

In the figure 2 40 pin IC (P89V51RD2) ports P0, P1, P2,P3 are used for various functions. In P0 port P0.3 to P0.7 pins are connected to A0 to A4 of APR900 IC to drive the speaker. P1 pins are completely interfaced with LCD display. In the LCD out of 16 pins 2 pins are grounded and 2 pins are given to supply, the two more pins are connected to P3.4 and P3.5. In P2 port P2.0 to P2.2 pins are used for checking circuit conditions likedoor lock, break, seat belt. P2 pins are internally connected with ULN2003 IC for the extra current to be supplied to the motor, buzzer and fan. In P3 port pin P3.2 is connected to TX of RFID reader. A 12V DC supply used as source for the module.

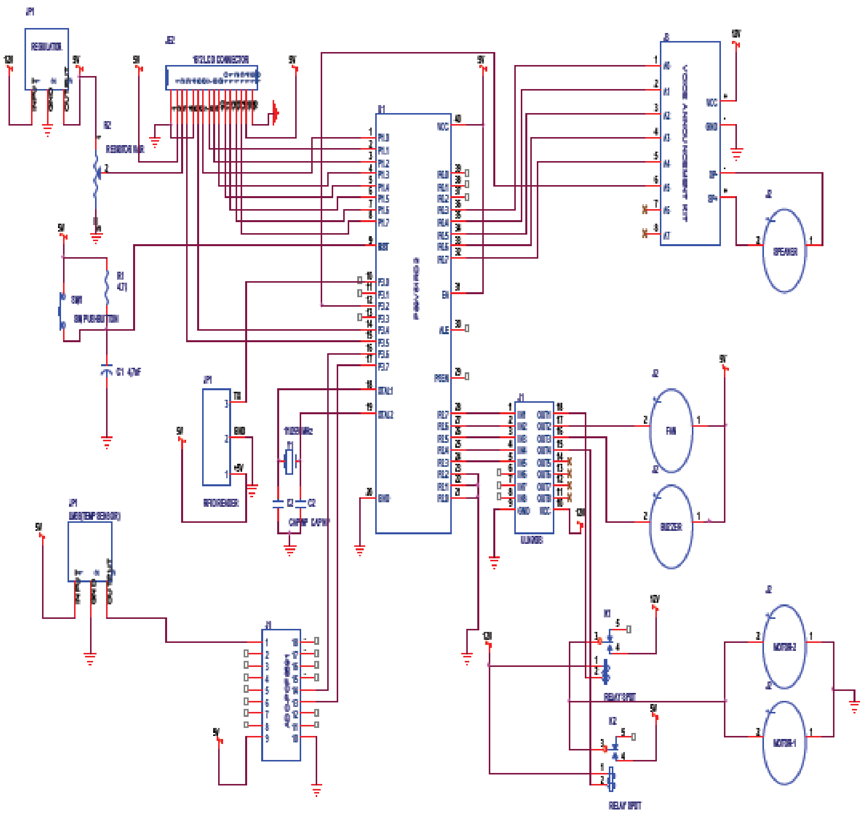

Fig. 2 Circuit Diagram

Working Methodology:
After powering the system, the controller keeps monitoring different parts of the vehicle. If brake, accelerator or clutch fails, the vehicle is stopped and the warning message will be displayed on LCD and speaker will give announcements. If engine temperature is beyond certain limit, fan is turned on. If the temperature is stillout of limit, the vehicle is stopped. LCD is used to give display indication to the driver. The speed control can be achieved by using relay drivers and is implemented with the wheel alignment of the vehicle, which controls the vehicle speed. An RFID reader is interfaced with the system which will collect the data containing the speed limit over that particular road. Each speed limit indicating signal on the roadside will have an RFID tag which will give the speed limit at that road. LCD displays the particular zone and speaker gives announcements.

IV. ALGORITHM

Step 1: start.

Step2: initialize LCD, microcontroller,ADC.

Step3: display welcome texts.

Step4: check seat belt, break, door lock, accelerator, and temperature of the engine.

Step5: if temp<45deg, fan off, normal speed.

If 45deg<temp<80deg, fan on, below normal speed.

If temp>80deg, fan on, vehicle stops.

Step6: if both step 4 and step 5 are true then go to

step 7 or else go to step 4 and restart the vehicle.

Step7: identify the different zones for example school zone, accidental zone, and hospital zone etc using RFID technology and announce in the speaker. Reduce the speed in all those zones. Run the vehicle in normal speed when the zone ends.

Step8: stop.

V. RESULTS

STATUS WHEN POWER SWITCH IS ON

Engine temperature control system

When the module is turned ON, the text WELCOME TO DSCE BENGALURU is displayed on LCD and checks for the parameters like door lock, seat belt checking, break check.

PARAMETER CHECKING

In the parameter checking it will first check if the door is locked and displays that condition on LCD display. Next it will check if the seat belt is ok and display it on LCD. The third parameter is checking if the break is OK and displays the condition on the LCD display.

1. DOOR CHECKING

Door lock

Check for the condition and displays that the door is locked.

2. SEAT BELT CHECKING

Seat belt ok

If the seat belt is closed, the above condition is displayed.

3. BREAK CHECKING

Break ok

Check for the brake condition and displays the above result if the brake is ok. If any one of the above conditions are not OK, the vehicle is made to stop and it will ask to recheck the conditions. The vehicle will run only if the above conditions are satisfied. Next the engine temperature is checked.

ENGINE TEMPERATURE

Eng temperature deg/cent (fan on vehicle off high temp)

In this condition, the temperature of the engine checked for three times to get the accurate temperature. If the temperature of the engine is above 40deg/C, the fan is turned ON and this condition is displayed on the LCD.

VARIOUS ROAD ZONES

When the vehicle is moving in different zones, it should maintain the speed limit in order to reduce the level of accidents. At these different zones, the speed is reduced. Here the zones that we have incorporated are hospital zones, accident zones. When the vehicle is nearby the zone and when the zone ends the respective conditions are displayed on the LCD.

Accident zone

Hospital zone

VI. CONCLUSION

This paper shows promising results, since active RFID technology permits to detect the presence and identity of speed limit in a particular zone reliably and sufficiently in advance, so corrective actions on the vehicle's behavior can be taken. In the empirical trials in our installations, the vehicle's speed was successfully changed as a result of the detection of the signals, increasing the driver's safety. The technology developed can assist human drivers in difficult road circumstances.

In our experiments, only the test vehicle was present on the road. In normal driving situations, we can expect other vehicles circulating nearby and possibly blocking or attenuating some of the RFID transmitting signals, especially with large vehicles like trucks. In this aspect, more experimentation is needed to know how this circumstance will affect the vehicle's control performance. A possible solution is the use of redundant RFID tags (since their cost relatively low), placed at different locations near the traffic signal, to guarantee RF signal reception in unfavorable conditions. Although the experiments described in this communication were carried out using traffic signals, RFID tags can be located in any place on the infrastructure (for example: traffic lights, temporary road diversions, pedestrian crosses, etc.). The results suggest that an automatic intelligent speed control system can be used to prevent any unexpected traffic circumstance and improve the safety of the occupants of the vehicle.

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