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IMPLEMENTATION OF SMART FEATURES AND ADAS FOR FUTURE AUTOMOBILES

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ABSTRACT

The project aims in designing a system that helps to control various features of a vehicle using android and also aids in driver assistance. The communication between the vehicle and mobile is a two way communication using Bluetooth. It is mainly designed to control features such as engine on/off, lock/unlock of doors, detection of leakage of LPG ,wireless turning on of a engine and also assist in driving by features such as Blind spot detection, Pre-crash detection. The controlling device of the whole system is a microcontroller. Bluetooth module, relay board and LCD display are interfaced to microcontroller.

KEYWORDS: Wireless communication,driver assistance,vehicle safety,increased automation,Bluetooth,pic microcontroller.

INTRODUCTION

Nowadays the automotive industry is growing rapidly due to advancement of electronics in automotive. The number of vehicles on the road is increasing continuously and hence also the accidents. Hence there is a requirement of systems which helps in increasing the safety, and assists the driver for better driving. This resulted in evolution of smart cars which automates the various features of a car. The demand for automated cars is increasing day by day, this has increased the competition levels in automotive sector to build a car that fulfils the desires of customers.

Such cars have automated features which make driving easy and safe. The key component for automation is development of ECU's. ECU refers to Electronic Control Unit it is the main component that helps in automating the features. Automation also helps in reducing the number of mechanical components involved, which reduces the maintenances time required for a component.

The main aim of this project is to use the available wireless technologies such as Bluetooth, for communication between the car and the driver to keep him updated with the present status of the car. It also involves features such as pre-crash detection, engine over temperature detection which involves in vehicular safety. The main controlling unit used is the PIC microcontroller, due to high speed requirements. The Bluetooth modem used helps in interfacing the mobile with the car and transfer required information.

MATERIALS AND METHODS

Major Components Used
1.PIC Microcontroller(16F877A)
2.Bluetooth Modem
3.GLCD Display
4.Relay Drivers
5.Relay
6.DC Motor
7.Infrared (IR) Sensor
8.Thermistor
9.MQ2 Gas Sensor
10.Smart Phone

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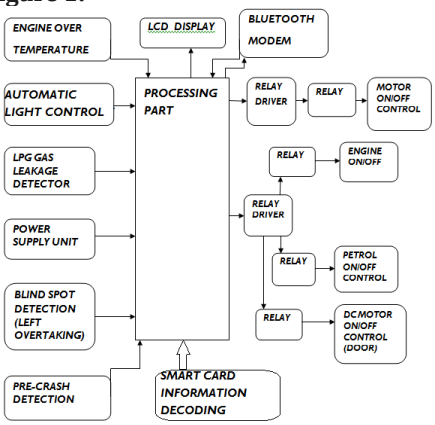
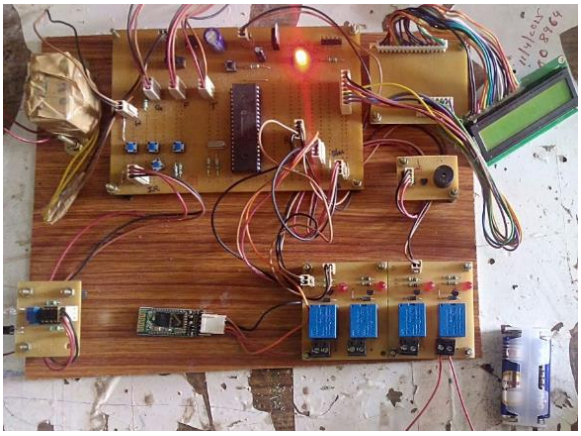
Figure 1:



Functional block diagram

Figure 2:

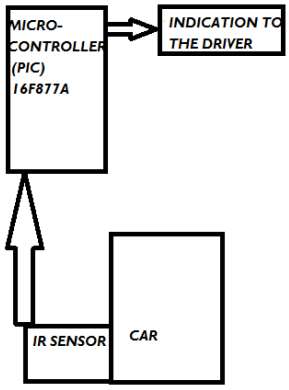


Functional model

Blind spot detection:

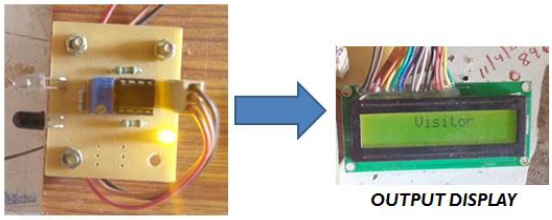
This feature gives an indication to the driver about the vehicle which is about to overtake our vehicle from the left side.Infrared (IR) sensor is implemented on the left side of the vehicle.This IR sensor contionously transmits the signals into the air.These signals after hitting an object are reflected back.The reflected signals are processed by the micro-controller and then an indication is sent to the driver.Thus this application can help prevent accidents as it alarms the driver about the vehicles overtaking his vehicle.[2][3]

Figure 3:



Blind spot detection

Figure 4:



Functional model

Petrol flow control:

This feature helps us to automatically control the flow of petrol in the vehicle.The control signal is sent from smart phone to the Bluetooth modemwhich is present in the car.This signal is then read by the microcontroller and a decision is made whether to turn on or turn off the petrol switch(relay is used as a switch in this case).Using this feature it is possible to save the fuel when it is not actually required by the engine.

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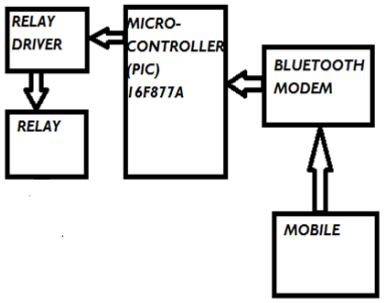
Figure 5:

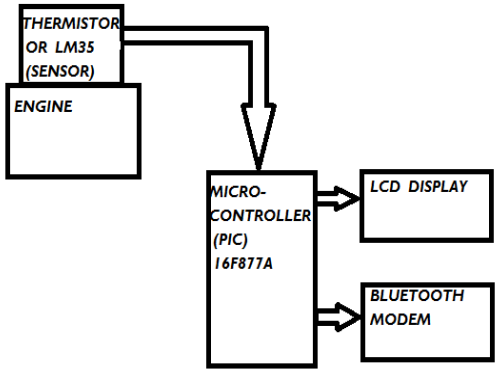


Petrol flow control

Engine Over-temperature Indicator:

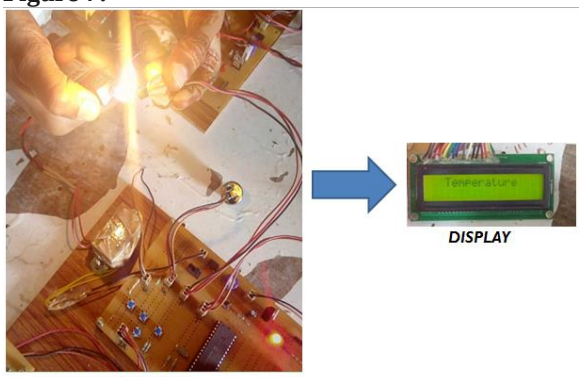
This feature is used to indicate the temperature of the engine.Here thermistor placed on the engine senses the temperature of the engine.This data obtained from the sensor is processed by the microcontroller and an indication is given to the driver by displaying it on the LCD display and simultaneously this signal is also sent to the Bluetooth modem so that it can be sent to the mobile.Using this application engine overheating can be prevented.

Figure 6:



engine over-temperature indicator

Figure 7:

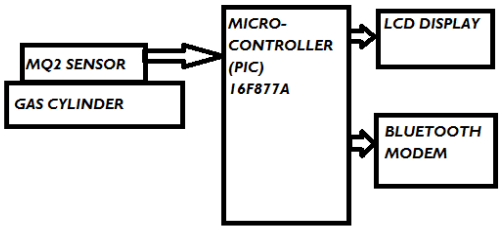


Over temperature indicator model

LPG-Gas leakage detection:

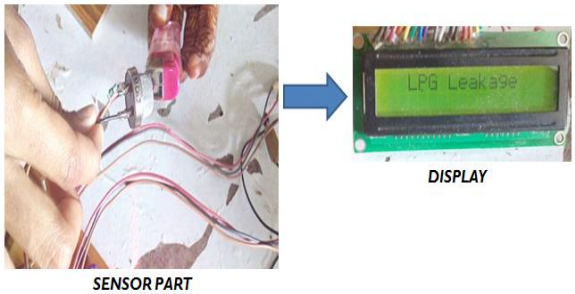
This feature enables the driver to detect any gas leakages in the vehicle.A gas sensor (MQ2 sensor) is used to detect the leakage.If there is a leakagein the gas then the sensor sends a signal to the microcontroller which inturn processes it and sends it to the LCD display so that the driver gets to know about the leakage and to the Bluetooth modem so that it can be sent to the mobile [4].

Figure 8:



LPG-Gas leakage detection

Figure 9:



LPG-Gas leakage detection model

Pre-crash indication:

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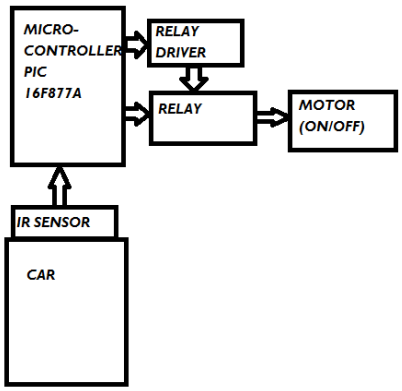
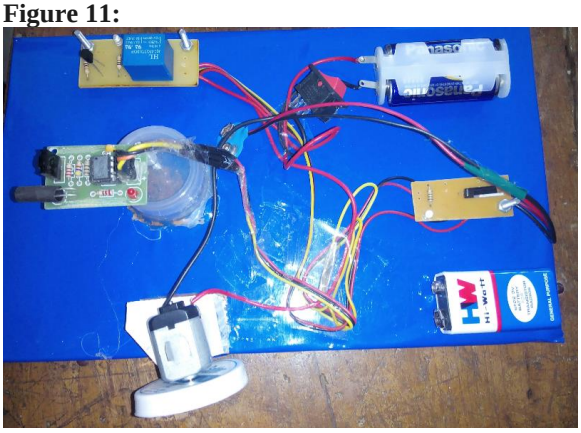
[1]This feature detects the possibility of collision before it actually happens.Here a IR sensor placed in front of a car continuously transmits the signal into the air.As soon as these signals hit a obstacle they get reflected.These reflected signals are received back by the IR sensor and is sentto the microcontroller for further processing.The processed signal is used to stop the vehicle(DC Motor in this model).Thus this application can help in avoiding front end collisions [3]

Figure 10:



Pre-crash indication

Figure 11:

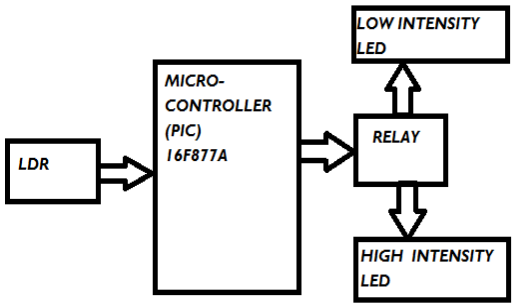


Pre-crash model

Automatic light intensity controller:

The main aim of this feature is to automatically reduce or increase the intensity of car headlight based on the intensity of car approaching in opposite direction. The main components required are a LDR, a Microcontroller, LED's and relay. The output of LDR is inversely proportional to the intensity of light falling on it, whenever a high intensity beam falls on it resistance level increases and the output current is reduced, similarly whenever a low intensity beam falls on it resistance level reduces and a high current flows as its output.The output of this is then fed to a microcontroller, this processes the output and sends a signal to relay which in turn drives the number of LED's (i.e.: either two or four).

Figure 12:



Automatic light intensity controller

Wireless engine on/off:

This feature is used to wirelessly on/off the engine. The required command that is on or off is sent through the smart phone to Microcontroller present in car via Bluetooth modem. This signal is processed and sent to a relay(electronic switch) which does the required function.

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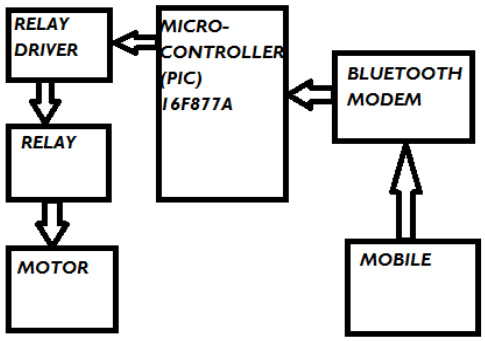
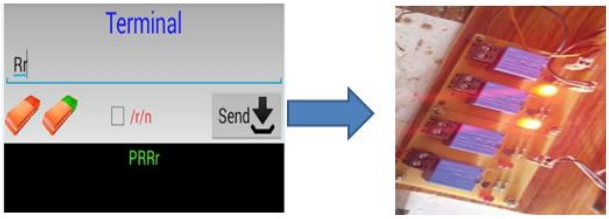
Figure13:



Wireless engine on/off

Figure 14:

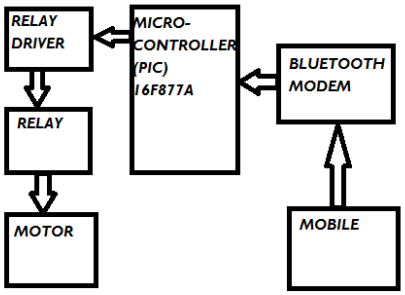


Control input through mobile ***Output part***

Wireless door locking and unlocking:

The main aim of this feature is locking and unlocking of a door wirelessly. The main components used are mobile for input, Bluetooth-modem, microcontroller, relay. A signal is sent through smart phone to a microcontroller using Bluetooth modem, which decodes the signal and sends the output to relay, which locks or unlocks the door [5].

Figure 15:



Wireless door locking and unlocking

RESULTS AND DISCUSSION

For applications like blind spot detection the reflected signal received by the IR is processed by the microcontroller and this processed signals turns on the alarm or buzzer.Similarly for pre-crash systems the output of microcontroller turns onor turns off the motor with the help of relay.

For applications like petrol flow control Bluetooth modem acts as a receiver which receives control signal from the smart phone and depending on the control signal the relay switch turns on or turns off (controlling flow of petrol).Similarly for wireless engine on/off contol and wireless door lock/unlock applications the mobile control signal processed by the microcontroller is used to turn on/off the DC motor.

The signals received by the MQ2 gas sensor is sent to the microcontroller which tells the driver about the leaksge by displaying a message on the dash board(LCD).

For engine over temperature indication message is sent to the dash board (LCD) after the microcontroller processes the signal received by the thermistor.

For automatic light intensity control application if current sent by LDR to the microcontroller is low (which indicates LDR is exposed to highly intense light) then a control signal is sent to relay which selects low LED light and vice-versa.

The signals processed by the microcontroller are used to drive the relays which in turn drive the DC motors in few applications and also to send the required

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signal to the lcd display(on the car's dash board) for driver's assistance and also to the mobile.

CONCLUSION

Using these features it is possible to assist the driver in driving the vehicle thus increasing his safety. Each and every application used here has its own benefits such as: blind spot detection helps the driver to know about vehicles while changing lanes.Pre-crash indication helps avoiding front end collisions.Gas leakage detection detects leakages thus preventing car explosions.Engine over temperature indication prevents over-heating of engine.Wireless door locking and wireless engine turn on provides more security to the cars(anti-theft systems).When all such features are brought together in one single system then that entire system can be used as a part of a smart car which inturn contributes in the development of the smart car.

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