International Journal of Interdisciplinary Innovative Research & Development (IJIIRD)
ISSN: 2456-236X
Vol. 03 Issue 02 | 2019

Adaptive Car Control and Safety System

Yash Prakash Parmar[1], Prof. Omprakash Mandge[2]
[1, 2] Department of Computer Science MET College, Bandra West, Mumbai

ABSTRACT

In India the overall automobile sales till now for four-wheeler vehicles crossed 86.7 million units last year. According to the (WHO), 80% of cars sold in the world are not compliant with main safety standards. Therefore the increasing number of vehicles in India also leads in increase of day-to-day road accidents. Many different inventions and ideas which may or may not have been practical about auto safety have been put forward but never made it to a production car. Safety features in cars always needs to be improved. There has been a dramatic increase in road accidents across the globe; out of which India ranks among the top with 1 in every 9, is reported in India.

1. INTRODUCTION

This paper discusses the framework for applying the most convenient and affordable car Control and Safety features in an after purchase, to a manual transmission car by making use of different types of sensors and other car control modules. The precise implementation and use of the sensors in a non-autonomous car affects in having a featured and will help in making the most appropriate decisions. The paper identifies problems of system adaption, usability, feasibility and the most important feature to be the safety of the driver, co-passenger, passengers and other vehicles and pedestrians on the lane.

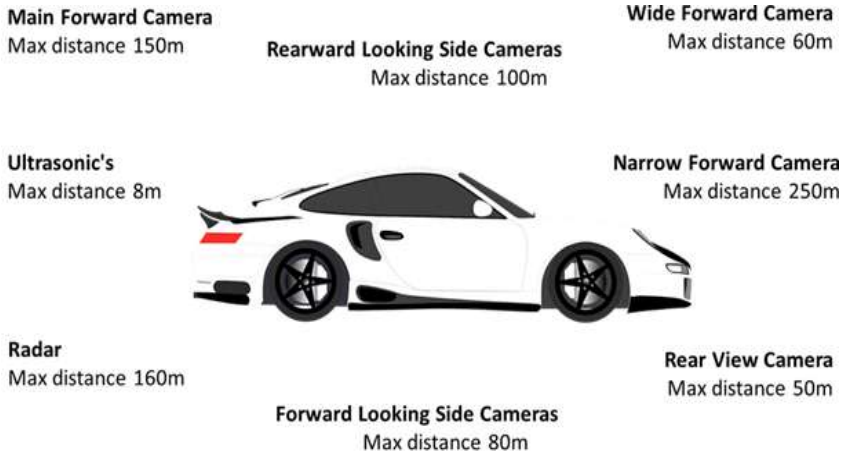


Fig. 1: Car Control and Safety System

1.1 Analysis

The cost to buy an automatic car ranges from 54lakhs for a base model to 1.2crore for a top model. Automatic Car Manufacturing companies like Tesla Motors have many auto transmission models available at a price that ranges from $74,500 to $135,000. That's in part because new cars are loaded with helpful but expensive safety and control systems. The top Model S P100D with Ludicrous mode is the third fastest accelerating production car ever produced, which have to propensity to achieve 0-60 mph of speed within 2.5 seconds.

Model - **S75D**	**S90D**	**S100D**	**P100D**
Cost - **$74,500**	**$79,000**	**$94,000**	**$135,000**

With demand constantly changing, the biggest car manufacturers in the world are producing the most advanced cars. Car manufacturers have developed their own Automatic Car Control Systems which consist of all the famous companies and their control system, viz:

- Audi : Adaptive Cruise Control
- BMW : Active Cruise Control
- Mercedes-Benz : Drive Pilot
- Ferrari Autonomous Car : Pista, GTB, GTC
- Google Self Driving Car (Waymo LLC self-driving technology)

As prices for new vehicles continue to rise, the cost of an average new car may be a stretch for typical households; a median-income household could not afford the average price of a new vehicle in any of the 50 largest cities in the country, though cars are more affordable in some cities than others. The idea is to provide with the most affordable control and safety features in an after purchase car. India "has delayed 20 years in making safety features mandatory," and due to a constant increase in car prices buying an automatic car is probably not very much possible for a middle class household.

Maruti Suzuki car models like Alto, Dzire, WagonR, Swift, Celerio and Omni on the other hand Hyundai has managed two spots with Elite i20 and Grand i10 while Mahindra Bolero and Honda City completes the list of top selling cars in India. All these models have a manual transmission mode, whereas the control and safety features are also low.

Maruti Suzuki's popular Alto car and the Tata Nano, which was launched as the world's cheapest car, are among those that have received a zero rating from the group. The Global NCAP tests are not mandatory for vehicles to be sold in India. All the models meet local safety standards, which are presently far more lenient than global ones. Therefore implementation of sensors will help in featuring such cars after purchase. Taking into consideration our Indian roads and statics report a total of 4, 64,910 road accidents are recorded in 2018; over speeding accounts for 70.4 percent of that number.

According to the (WHO), 80% of cars sold in the world are not compliant with main safety standards. There has been a dramatic increase in car accidents across the globe; out of which India ranks among the top with 1 in every 9, is reported in India. It is seen that road accidents is the No. 1 cause of death among children and young adults in the age groups of 5-29 years.

- One serious road accident in the country occurs every minute and 16 die on Indian roads every hour.
- 1214 road crashes occur every day in India.
- 377 people die every day, equivalent to a jumbo jet crashing every day.
- 16 children die on Indian roads daily.

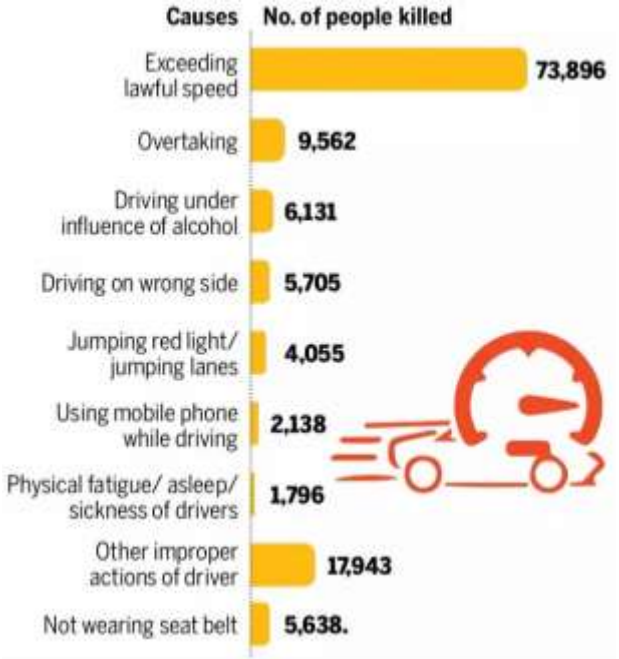


Fig. 2: Overspeeding the leading killer on Indian roads

1.2 Source of Information

National Crime Records Bureau, Ministry of Road Transport & Highway, Law commission of India, Global status report on road safety 2018

1.3 Literature review and Research objectives

To provide the most suitable safety features in a after purchase car by making use of different types of sensors, Camera Module, Video Streaming Interface and Circuit boards. An approach in development of this project we will be able to fulfill these features in a very cost efficient and adaptive manner.

- ✓ Collision awareness
- ✓ Lane Assistance
- ✓ Reversing Camera
- ✓ Speed Limit Recognition
- ✓ Distance Recognition
- ✓ Blind Spot Assist

1.4 Technologies to be used

The following sections provide detailed descriptions of the individual sensor systems, the current status of future developments.

2. ULTRASONIC SENSOR FOR OBJECT DISTANCE CALCULATION

Ultrasonic sensors work on the principle of reflected sound waves and are used to measure distance. One sensor can detect others operating nearby. Sound waves are emitted by the ultrasonic sensor and they're reflected back if there is an object in front of it. The sensor detects these waves and measures the time it takes between transmitting and receiving those sound waves. Distance is then estimated by the time interval between sensor and object.

Ultrasonic sensors for short-range (24 GHz) or long range (77 GHz) are located in the front and back of the vehicle to monitor traffic. If the sensor detects the object i.e. any other vehicle in the range than it will immediately indicate the driver on the dashboard. In an advanced system the same detection can result into application of immediate brakes. The waves transmitted also helps during parking of the vehicle.

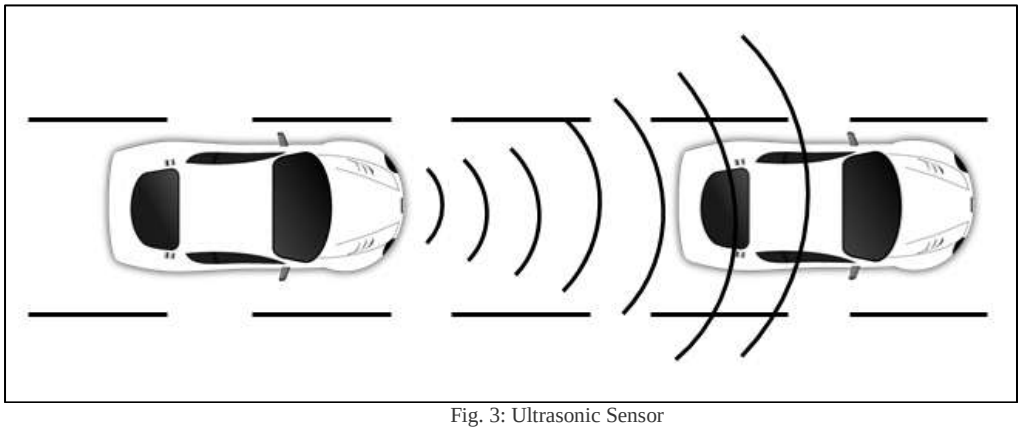


Fig. 3: Ultrasonic Sensor

Two to four sensors are fitted to the bumper of the vehicle and painted with the same color of the bumper where the sensors can receive and send ultrasonic signals, and detect any obstacle that enters the signals. Furthermore, the signal is converted as alarm to alert the driver and avoids a potential accident. They are installed by placing a transceiver adhesive strip along the inner side of the bumper. They eliminate making holes for installing sensor which preserves the appearance of the vehicle. When the vehicle is in reverse gear, magnetic field is generated by the control unit and is transferred to the adhesive strip which helps in detecting the obstacles. The control unit detects obstacles such as person, wall, vehicle and etc. and sends series of audible tones to alert the driver and preventing a potential accident. This sensor not only detects objects when the vehicle is in motion but also when it is at standby and provides real time feedback. These sensors have the option to switch on and off whenever required.

3. MMI (MULTIMEDIA INTERFACE) VIDEO STREAMING USING RASPBERRY PI AND CAMERA MODULE

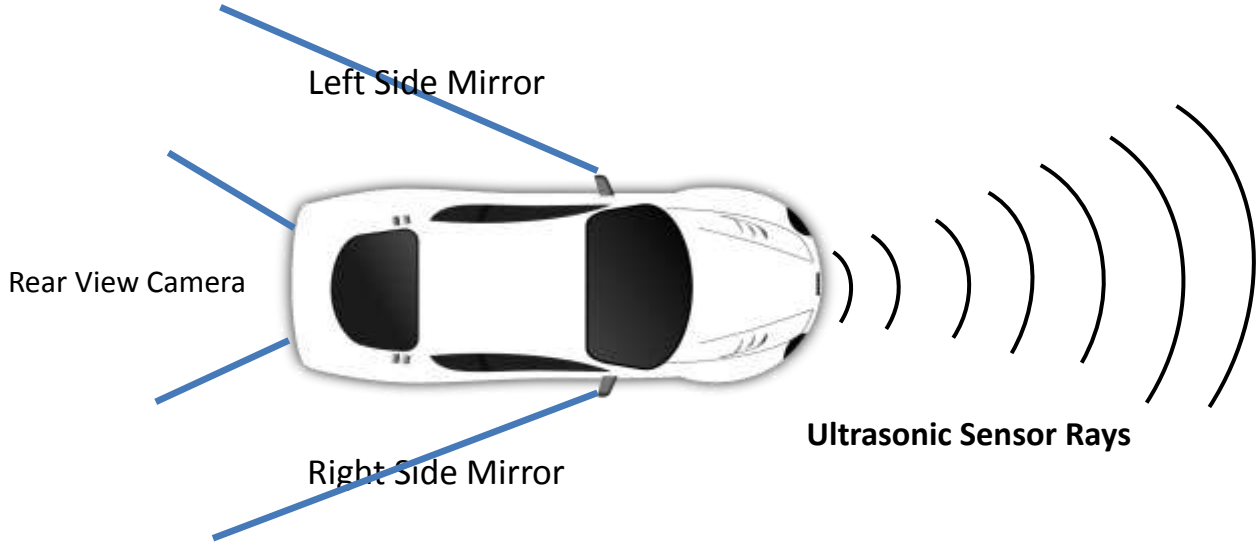
Normal car have a single rear camera which approximately covers upon a less wide range of the rear view. The view out the range of the rear camera stands out to be a blind spot, which most of the cars tries to cover up by adding a convex mirror on a Side View Mirror of a car also called as Blind Spot Mirror.
Video images provide most of the details for the human driver but are also suitable as an input parameter for high alert driving. Usually a car only has one rear camera at the back, therefore the view through it is not much wider, an idea is to implement a camera on the Left Side and Right Side Mirror of the car, through which the Blind Spot being created in the earlier system is eliminated.

Live streaming video cameras can be used for security or personal purposes. A variety of webcams, camcorders, DSLRs and mirror less cameras for streaming live video are available in the market. When accessing multiple cameras on the Raspberry Pi, you have two choices while constructing your setup:

- Either we can use multiple USB webcams.
- Or using a single Raspberry Pi camera module and one USB webcam connected and rest of the camera module in sequential ports.

MMI Video Streaming

Cam1 + Cam2 + Cam3 = MMI



Raspberry Pi Circuit Module has an inbuilt Camera port available, due to which a wider view is achievable where Footage of Camera1 + Footage of Camera2 + Footage of Camera3 will result into integration of all the three videos streaming in a Multi Media Interface display. The Raspberry Pi board has only *one camera port*, so we will not be able to use *multiple*Raspberry Pi camera boards (unless we want to perform some

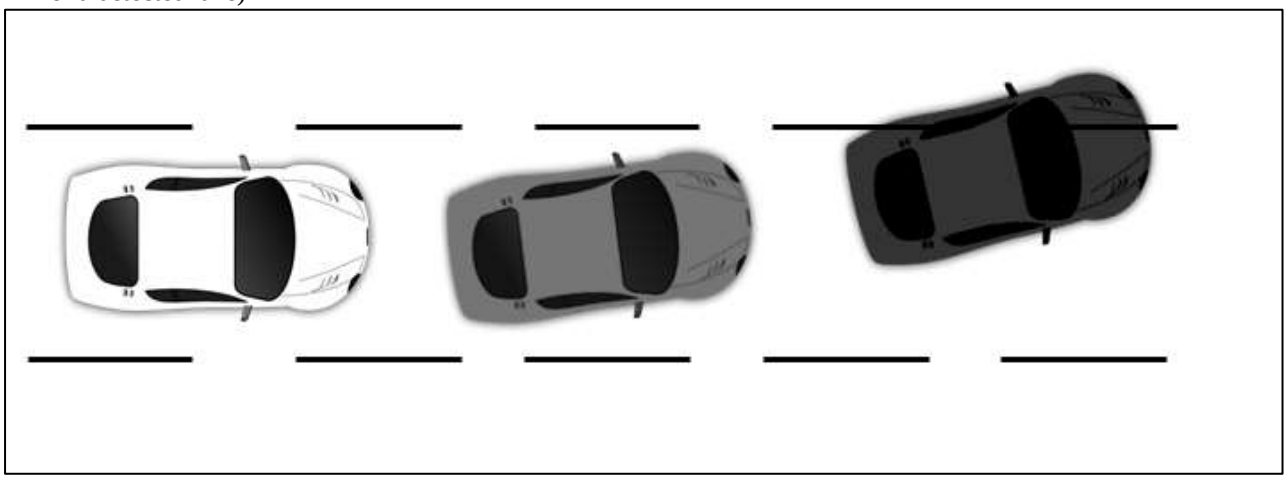
extensive hacks to your Pi). So in order to attach multiple cameras to your Pi, we need to leverage *at least one* (if not more) USB cameras.

A Raspberry Pi camera module + (optional). We can interface with the camera using the picamera Python package. Today's Camera Systems use CMOS image sensors that can monitor ranges from a centimeter up to a few hundred meters. For example, the cameras can identify pedestrians and cyclists, motor vehicles, side strips, bridge abutments, and road margins.

4. LANE GUIDANCE CAMERA MODULE FOR LANE DEPARTURE WARNING SYSTEM

A lane detection system used behind the lane departure warning system uses the principle of Hough transform to detect lane lines from real-time camera images fed from the front-end camera of the automobile. When the driver signals to take a turn right or left the camera on the mirror will transmit the video footage to the central screen revealing nearly an enlarged view more than the passenger-side mirror alone. This keeps the driver aware of the surroundings and eliminates the blind spots while driving.

- Video sensors in the visual domain (mounted behind the windshield, typically integrated beside the rear mirror)
- Laser sensors (mounted on the front of the vehicle)
- Infrared sensors (mounted either behind the windshield or under the vehicle)
- Vibrator (rapid vibrations on the steering and a warning at the central screen that the vehicle is drifting out of a detected lane)



This also prevent loss of control around tight corners, the system stabilizes the car by providing accurate lane assistance.

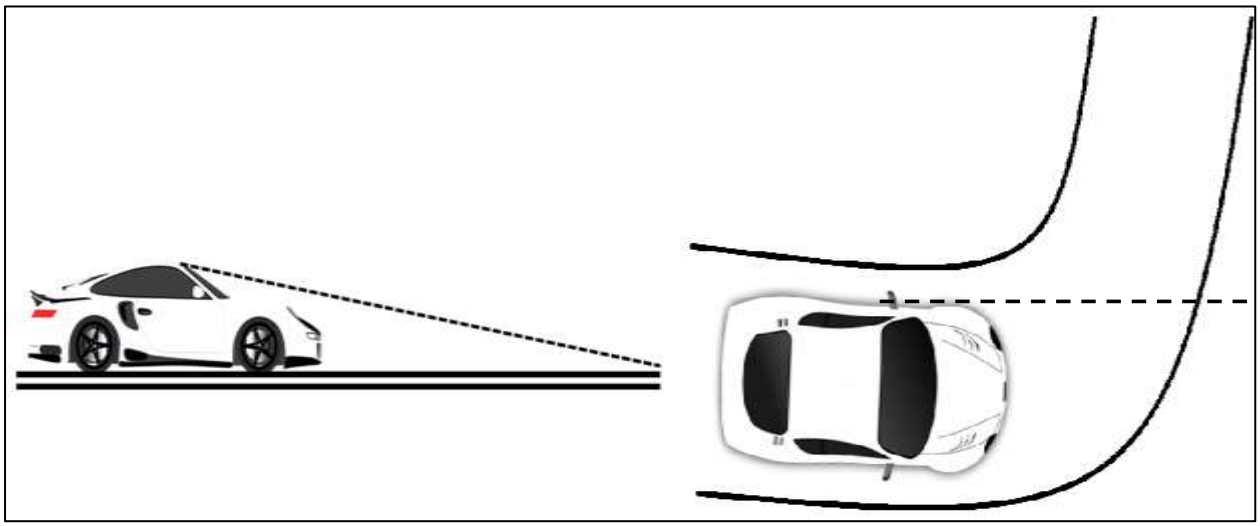


Table 1: Planning and Budget for prototype and original project

Serial No.	Component	Price
1.	Raspberry Pi Module	1100 x 3 = 3300
2.	Ultrasonic Sensors	450 x 4 = 1800
3.	Camera Module	700
4.	Cameras	550 x 5 = 2750
5.	Laser sensors	780
6.	Infrared sensors	690
7.	Vibrator	550
8.	Actuator	490
9.	LCD Display (6 inch)	3000
10.	Jumper Wires	300
11.	Other Miscellaneous	3000
12.	Total	16360

5. CONCLUSION

Safety is the eternal theme of automobile technology development. With the development of society and economy, Car ownership keeps increasing; the urbanization promotes the change of urban and rural traffic environment; and the problem of automobile safety becomes more and more serious. The major goal of this research paper was to give the driver all the possible safety features by making in use of sensors and camera module. The best part of this project is that you can view the video live streaming on multiple devices like computer, tablet and phones. You can also move its camera lens wirelessly for wide-angel views. The sensors if damaged can easily be replaced in less time and cost. Various research papers, inventions and enhancements are being carried out and implemented as well but the increased cost hesitate the user to invest in such cars. Implementing specified sensors and defined camera module stands out to be cost effective on a large scale and provides driver with more ease in driving.

Going through various research papers one thing is sure, i.e., this kind of system stands out to be more accurate and less costly. With the use of the system proposed in this research paper there are high chances of increasing the safety and can bring reduction in human error while driving, more number of accidents and road incidents can be reduced in the country.

6. REFERENCES

[1] National Crime Records Bureau, Ministry of Road Transport & Highway, Law commission of India, Global status report on road safety 2018
[2] DK Publishing (Dorling Kindersley) “Pocket Genius: Cars, Facts At Your Fingertips” Genre: Juvenile Nonfiction
[3] Vanessa W.S. Tang, Yuan Zheng and Jiannong Cao, “An intelligent car management system based on wireless sensor networks”
[4] Mala Aggarwal, Simmi Aggarwal and R.S. Uppal, “Comparative implementation of automatic car parking system with least distance parking space in wireless sensor networks
[5] Car Safety Guide - Consumer Reports
[6] Car Safety Equipment - Driving Information - DriversEd.com
[7] Automobile Safety System Seminar Report