PARKING ASSIST SYSTEM

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Abstract: Automobile is a self-propelled vehicle. Everyday a new automobile is launched. The revolution makes the automobiles equipped with many advanced technologies which make the journey safe and comfortable. Mechanical engineers are having 'Lion's Share' in the revolution of automobiles. Some of the major developments in the field of automobiles or automotive technology have come in past 10 years in the area of performance, safety and comfort. Everyday a new vehicle is launched with some new enchanting and smart technology, but only few are accepted and preferred by customers. Now a day's new technology is the only thing which puts the automobile a step ahead than the other competitors. In this paper a new technology which has made the good positive effect in the field of performance and comfort is discussed.
Keywords: IPAS, Sensors, Driving assist system, Driving assist in traffic jam.

I. INTRODUCTION

In this paper I will be focusing on a new technology which is IPAS. IPAS stands for Intelligent Parking Assist System. It is a technology developed by Toyota group in 2003. The system uses computer processors and sensors for reverse and parallel parking of vehicle without intervention of driver. It has been used in many cars.

II. IPAS (Intelligent Parking Assist System)

A. Objectives of IPAS

- Neat parking even in compact space.
- Less time for parking.
- Ease of parking for untrained driver.

B. Innovation

IPAS was first introduced in the year 2003 in Toyota Prius and then for Lexus.

III. WORKING OF IPAS

The extensive use of computer and sensors result into the intelligent parking assist system. In this, computer processors are connected with the vehicle's sonar warning system, backup camera and two additional front sensors. The sonar warning system consist of additional multiple sensors which detect obstacles allowing the vehicle to sound warnings. It calculates optimum steering angles during regular parking. The sensors along with additional parking sensors fed data to central computer processor. The computer processor displays the imagery data obtained by backup camera and sensors on the screen in the car. This enables driver to get visual parking information. When the parking assist system is used, the processors calculate angle of steering according to the received data and are displayed on the screen. Driver is able to see all the information on vehicle's navigation screen at a glance. Other information such as obstacles, warning messages and proposed path which will be tracked by the vehicle are shown on the screen. The Intelligent Parking Assist System expands on this capability and automatically access the functionality of parking assist when the vehicle is shifted to reverse. This also automatically activates the backup camera. When in reverse, screen features parking buttons which can be used to activate automated parking procedure. When the Intelligent Parking Assist System is activated, all the data is fed to the central processor which in turn performs all tasks. It calculates the optimum parallel or reverse park steering angles and accordingly operating Electric Power steering systems of the vehicle to park the car into desired parking space. Considering the safety of the driver and to maintain the human decision accuracy along with automation certain provisions are made. When the steering wheel is touched or the brake hard pressed, the automatic parking mode will stop and the vehicle will be in full command of the driver. The vehicle also cannot exceed the pre-set speed limit. On the indication of completion of parking assistance by vehicle's computer, the vehicle is shifted to the manual mode. The driver is again in full control of the vehicle. The driver may again make necessary adjustments if necessary.

IV. TYPES OF PARKING

Two types of parking are possible by IPAS.

A. Reverse Parking

Fig.1. Parking area for reverse parking

The position of the vehicle should be such that its rear cameras should be having the perfect view of the parking area so that the driver will choose the parking space from display to proceed for Intelligent Parking Assist System. This type of parking is observed generally in the parking basement or where the area is reserved for the parking is ample. The car is parked in a vertical manner with respect to the parking space. The front or rear sensors play an important role depending on how you face the vehicle while parking.

B. Parallel Parking

Fig.2. Parking area for parallel parking

The position of the vehicle should be such that the its rear bumper passes the rear wheel of the car parked in front of the open space so that according to rear view cameras the IPAS will drive the car in open space. This type of parking is observed generally along the roads or where the parking space available is not ample. The car is parked All the sensors play important role while parking the vehicle in such mode. The IPAS simplicities the difficult parallel parking by using sensors and advanced computing.

C. Application
- Toyota
- Hyundai
- Audi
- Volkswagen etc.

D. Limitations
- The cost of the vehicle is more after the integration of IPAS.
- Full automation is not yet implemented. Final decision has to be made by drivers. The driver can stop parking assist at any moment as per his wish.
- The driver has to adjust the vehicle before parking so that the desired parking space is in full view of the sensors.
- Trained drivers may feel the process time consuming.

E. Advantages
- The vehicle is parked neatly even in the compact space.
- It is very useful for unskillful drivers.
- The vehicle is parked very systematically. IPAS uses the available parking space to its maximum potential.
- While IPAS parking the vehicle, the driver can utilize that time to perform some other work.

V. WHAT TO EXPECT IN NEAR FUTURE

If the technology mentioned above is integrated more with the core of the vehicle, the automobile sector ought to benefit. Frankly, this technology is now so advanced that a car can be driven by its own making use of advance computing and sensors. On the other hand the cost of the car crosses the budget of a common people. So the technology should be implemented such that it will benefit further without much increase in the cost. One of such application can be as:

A. Use of Driving Assist system in heavy traffic
Nowadays no one can avoid the traffic jam especially in the cities. The drive has to use clutch, brake and accelerator continuously and accurately. This induces fatigue in the driver. His leg might get strained because of continuous use of the clutch. So to face the traffic jam at the end of the day after working in the office is tedious. This also led to prefer automatic transmission vehicles over traditional ones. But vehicles equipped with automatic transmission are costlier that the traditional ones. In developing countries automobile market, cost is one of the important factors for the customers where they are even ready to compromise with the safety over the cost. So it is necessary to adopt the technology which will not increase the cost tremendously. Providing driving assist in heavy traffic by using sensors and computers can be considered as an option. This will assure that the car will be driven without human help in heavy traffic making use of sensors and computing. This is similar to the IPAS except the sensors used are in the front side of the vehicle. By making the use of data obtained by the sensors and processing it in the computers, the vehicle will move according to the movement of the vehicle which is present at the front. The sensor will capture the details of the vehicle and will measure the distance between the two vehicles. The distance to be kept in between two vehicles can be predefined. The maximum speed of the vehicle in the drive assistance mode is also predefined. The driving assist system will maintain the predefined parameters constant and make the driving in heavy traffic stress free. The quick and accurate provision has to be present so that the driver can disable this assist system at any time and drive the vehicle manually. The driving assist system will be more beneficial when the vehicle is stuck in the traffic at the inclined roads. The driver has to use clutch and brakes extensively to maneuver the vehicle and they have to use so called Half-clutch technique. It is difficult for the new as well as experienced drivers to drive in these conditions. So this driving assist system will be very helpful for them. So this system will ease the driving process at comparatively lower cost. This type of system is in development by BOSCH Company. In this system the vehicle will be steered laterally and longitudinally. The driving assistance system will always analyze the speed and the position of the surrounding vehicles. The driver has to supervise system and be ready to take control from the system after the notification is displayed by the system. This first development of driving assistance system in traffic is expected to enter series production in 2015.

VI. Conclusion
The IPAS technology is not fully dependent on mechanical systems as conventional but now it also relies on electronic

systems. Electronics is making mechanical operations more accurate and easier. Entry of electronics in automobiles is proving advantageous. Many technologies in the area of safety, comfort and performance are coming with electronics based systems. To achieve the best results in automation of automobiles electronic based system is the best option. Bulky and costly mechanical systems are replaced by compact electronic system. The safety as well as performance is getting more significance in recent years which results into development of new technologies.

VII. ACKNOWLEDGMENT

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