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ELECTRONIC STABILITY PROGRAM (ESP): A REVIEW

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Abstract
The vehicle Electronic Stability Program (ESP) is a new type control system that improves the safety of a vehicle's stability by detecting and minimizing skids. It is developed based upon the vehicle anti-lock brake system (ABS) and traction control system (TCS). The ESP system automatically applies the brakes to help "steer" the vehicle where the driver intends to go the vehicle movement according to the driver's intention, road conditions and motion states of the vehicles, to improve the automobile controllability and stability, and driving safety as well. The paper introduces the vehicle dynamic model and the structure of the ESP control system. The new designed method of the ESP control system overcomes the drawbacks of speed, cost and stabilization of the traditional ESP control system implemented by the dedicated processor.

Introduction:
Electronic stability control (ESC) is an in-vehicle technology whose goal is to help the driver maintain directional control of the vehicle. The system continuously monitors the driver's actions and contrasts it with the behavior of the vehicle in order to detect an impending loss of control (LOC) such as in severe under- and over-steer situations. If an impending LOC is detected, the sys- tem reacts within milliseconds and independently applies the brake to the wheels to counteract any under-steer or over-steer. In addition, the system reduces the throttle. The system passively monitors the driver's inputs and vehicle state, activating only during imminent LOC situations. The system does not have any effect on the vehicle or the vehicle's performance during normal driving. Unlike systems such as traction control or Anti-lock Braking Sys- tem (ABS), where a properly trained driver could conceivably apply the same counter-measures, the independent wheel braking utilized by ESC cannot be applied by the driver alone. ESC works in conjunction with ABS to ensure that directional control is main
tained even under severe braking maneuvers taking place at high speed.
There are several manufacturers that provide ESC as either standard or optional equipment. In all cases, the fundamental operation of the system remains the same, although the name and detailed implementation of the system varies depending on the manufacturer. Some of the names used for these systems are: Electronic Stability Program (ESP), Active Stability Control (ASP), Dynamic Stability Control (DSC), Vehicle Stability Control or Vehicle Skid Control (VSC). Due to its integration with the vehicle, ESC can only be installed by the manufacturer and cannot easily be retro fitted into an existing vehicle.
Empirical study of ESC poses several challenges. Because ESC only activates during LOC situations, it is nearly impossible to create controlled yet safe situations in which ESC can be assessed with drivers from the general population. Performing tests in a controlled environment such as a test course creates a high risk of collisions, rollovers and other violent maneuvers that would endanger the participants. Such environments are also limiting because creating realistic and controlled interactions with multiple other vehicles at realistic speeds is difficult, if not impossible.

Literature Review:
While driving a car there may be the possibility of that suddenly any obstacle can come in front of the car. In such cases, driver reacts quickly by rotating the steering fastly. This results into loss of control of the driver on the vehicle and results into accident of vehicle

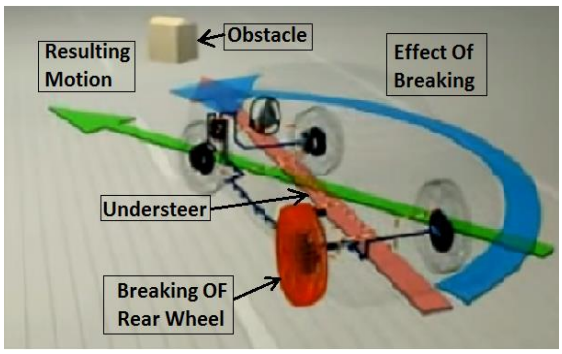

Fig (a) Working of ESP during avoiding the obstacle.

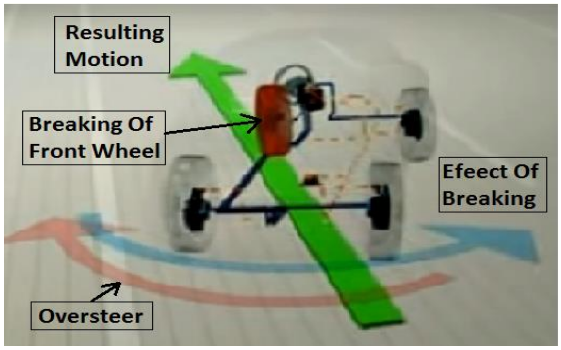

Fig. (b) Working of ESP after avoiding the obstacle.

Fig. (a) shows the working of ESP during avoiding the obstacle. When any obstacle is coming in front of the vehicle, suddenly driver steers the vehicle but in absence of ESP the vehicle will not respond to the steering this will cause the vehicle to skid towards obstacle. This is called as condition of Under steer. But in presence of ESP vehicle can be easily stabilized. While suddenly turning towards left steering angle sensor senses the rotation of steering. While rotational rate sensor sends the signal to control unit that vehicle is not responding to drivers steering i.e. drifting to obstacle. In fraction of seconds ESP brakes the left rear wheel by applying breaking pressure briefly and sharply. This braking force causes vehicle to rotates in the direction of steering of the vehicle and avoid the obstacle.

Fig. (b) shows the working of ESP after avoiding the obstacle. After avoiding obstacle vehicle needs to continue its forward moving motion. To maintain the lane driver will suddenly steer the vehicle to right but in absence of ESP the vehicle will not respond to the steering this will cause the vehicle to rotate rather than turning. This is called as condition of Over steer. But in presence of ESP vehicle can be easily stabilized. In this case torque towards right is greater than driver wants, in such cases ESP brakes the left front wheel and torque reduces instead of going to skid the vehicle stays on the road or lane.

Conclusion:

We believe that high fidelity simulation can be effectively used to study ESC effectiveness under a variety of LOC scenarios. Study findings validate existing epidemiological results which strongly supports the notion that results obtained in a high-fidelity simulator can be projected to the general driving population.

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