SMART AIRBAGS: AN AUTOMATIVE COMFORTABLE AIRBAG CONTROL SYSTEM

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Annotatsiya: *ushbu maqolada avtomobilning airbag yani xavfsizlik yostiqlari haqida barqaror xozirgi zamon uchun xavfsiz manba sifatida muhokama qilinadi. Bu inson hayoti uchun muhim ro'l o'ynashini, shu jumladan uchrab turadigan avtoxalokat paytida inson sog'ligini imkon boricha yaxshi holatda bo'lishini ta'kidlaydi, shuningdek xavfsizlik yostiqlarini joriy etish bilan bog'liq ba'zi muammolarni qamrab oladi.*

Keywords: *Faol boshqaruv tizimi, aqlli transport tizimi, safety, ESP, aqlli airbag, transport vositasi uzunligi, lateral va vertikal dinamik.*

Аннотация: *В этой статье рассматриваются автомобильные подушки безопасности как устойчивый источник безопасности на сегодняшний день. В нем подчеркивается важная роль, которую он играет в жизни человека, в том числе сохранение здоровья людей в случае автомобильной аварии, а также освещаются некоторые вопросы, связанные с внедрением подушек безопасности.*

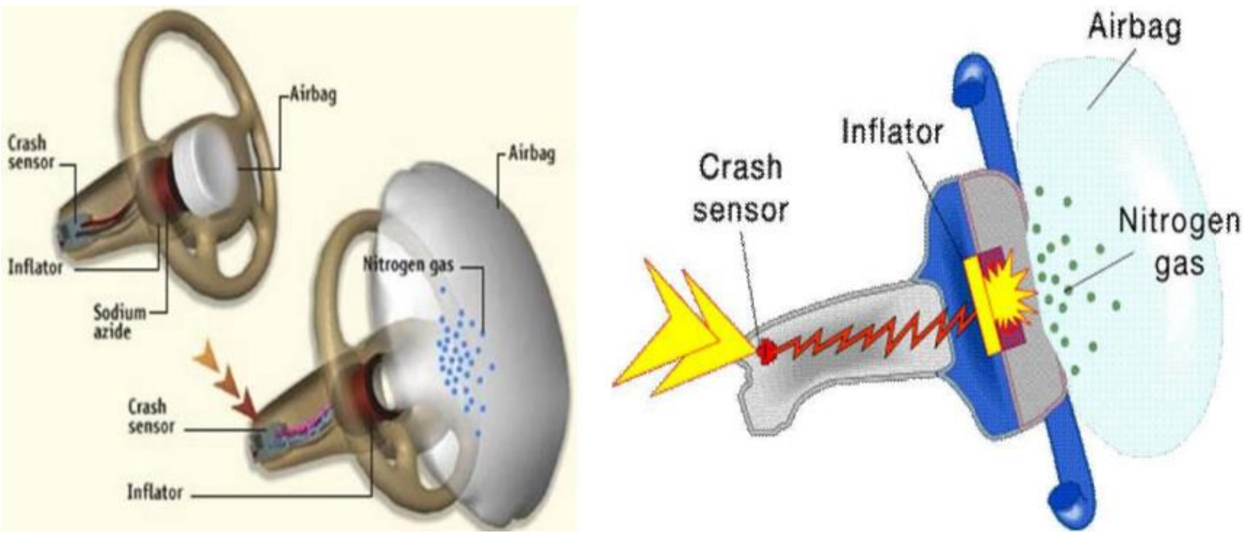
Ключевые слова: *Система активного управления, интеллектуальная транспортная система, безопасность, ESP, интеллектуальная подушка безопасности, длина автомобиля, поперечная и вертикальная динамика.*

Annotation: *This article discusses car airbags as a sustainable source of safety for today. It highlights the important role it plays in human life, including keeping people as healthy as possible in the event of a car accident, and also covers some of the issues associated with the introduction of airbags.*

Keywords: *Active control system, intelligent transport system, safety, ESP, intelligent airbag, vehicle length, lateral and vertical dynamics.*

Introduction. Active control system has an indispensable effect on vehicle stability, performance and safety.So, design and implementation of control systemsis one of the most effective methods, which could considerably enhance the vehicle stability and controllability. Motion control, stability maintenance and ride comfort improvement are fundamental issues in design of active control systems. In this paper, intelligent vehicle systems are introduced and in order to optimize the vehicle safety smart control systems such as smart airbag by GPS, electronic stability program (ESP), Traction control system (TCS) and active suspension systems are developed for passenger vehicles. Also advanced smart highways technologies with communication systems are presented.

Literature analysis. This literature review confirms prior work in the use of locomotive airbag technologies for vehicle or pedestrian collision mitigation, and to focus planned activities and tasks for this research. This report summarizes the state of the art in relevant technologies to assess the feasibility of this technology and identify critical model challenges for supporting impact simulations. The literature review did not reveal any currently deployed locomotive airbag solutions. In patent literature, external airbag technology has been described for crash mitigation between railcars and motor vehicles, but no meaningful analysis of feasibility has been discussed in detail in scientific or professional literature. Therefore, it appears that although crash mitigation technology using airbags in front of locomotives has been conceptualized, it has not yet been rigorously engineered or implemented

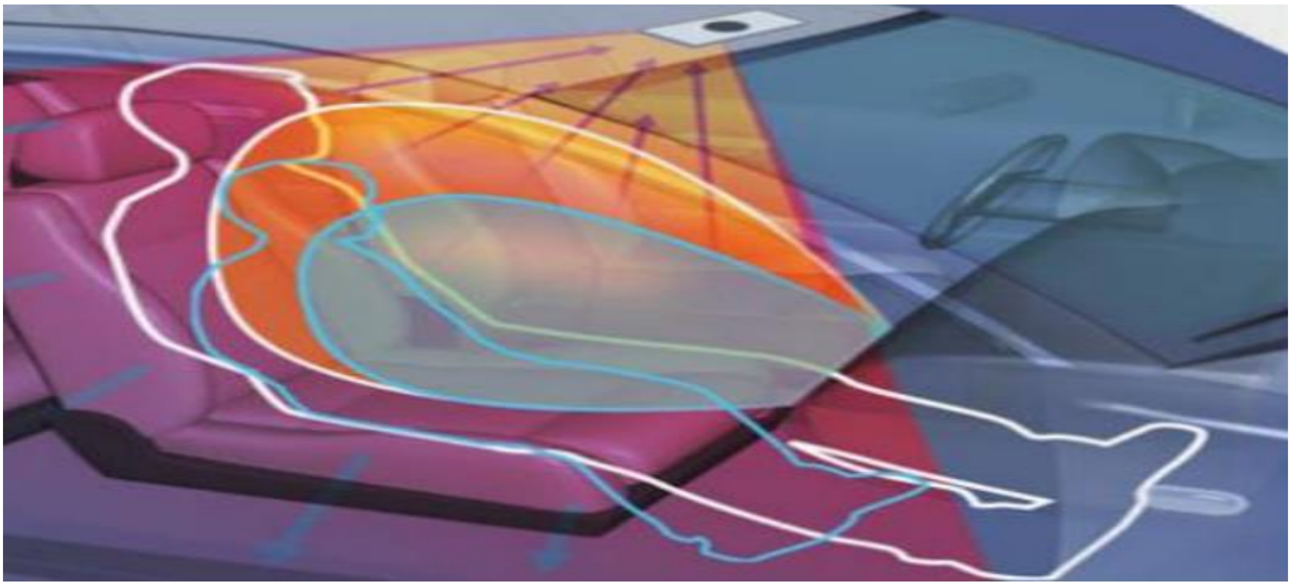


1-picture. airbag structure and performance

With the recent increase in automotive safety consciousness, driver and passenger seats with seatbelt pretentioners have become standard equipment in virtually all vehicles in conjunction with improvements in collision safety technology and awareness of the importance of fastening seatbelts

Smart airbags make use of a variety of additional sensors to determine whether the system should deploy. Most basic form of smart airbag simply has an embedded weight sensor in the front passenger seat. If the passenger is below a certain threshold, the airbag system will shut off. This is sometimes referred to as a seat occupancy detector, and the same type of system can be used to trip a seat belt warning indicator or alarm. More complicated smart airbag systems also include other sensors. Some of these systems can determine the position of the passenger on the seat with ultrasonic sensors (figure 2), which can allow the system to shut down if the passenger is too close to the dash. Other systems are capable of determining whether there is a car seat present, which will then prevent the airbag from deploying.

Other smart airbags are capable of modulating the force that they use to deploy depending on the weight and position of the passenger. Another type of smart airbags which is developed in this paper, are equipped with GPS system. In this system, after acting the air bag for higher lateral acceleration, airbag system send signal to GPS system to report the accident location to relief center.



2-picture: smart air bag performance

Seats should reduces the trasmitted accelartaion, impact and displacement to driver and passengers and have ability to resist agains tension and pressure forces over sever manouvers. As shown in figure 5, seats according instalation can be divided to three category include: floor, ceiling and wall mounted. Another technolgy for suspended seats is using MR damper fluids to damp vibration according displacement magnitude. These suspension systems utilize semi active control to regulate the damping coeffiecient by applying electrical current. They demonstrate the rapid response and wasting more energy than the conventional dampers. In order to simulate the vertical dynamic of vehicle, 10 dof vehicle model with considring tire, suspension, seat and driver model is used.

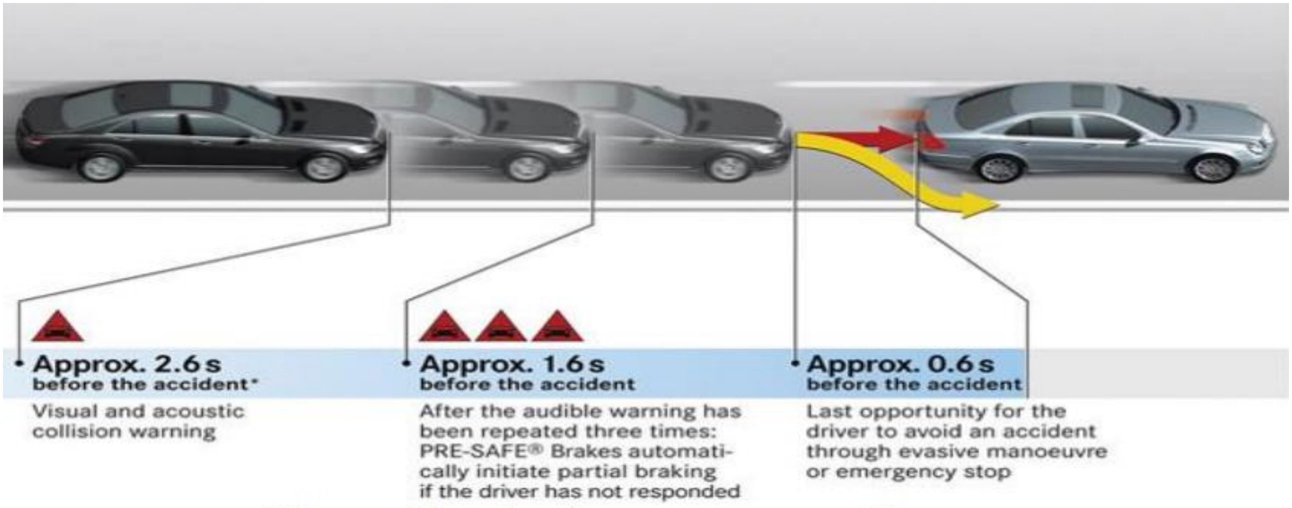
2-picture:modular structure

The main passive safety system to reduce injuries and deaths caused by accidents and transmitted acceleration to passengers is seatbelt. In this paper conceptual design of smart seatbelt developed. In this intelligent system, if the passengers do not fast the seatbelt properly, vehicle fuel and speed limited to decrease risk. For this purpose sensors installed on belt buckle and belt tension to send a signal to ECU to control vehicle speed and fuel rate if it is not fasten correctly. If passengers do not install the safety belt buckle or pull the seat belt is not enough, sensors send data to the ECU to reduce fuel injection to keep the vehicle speed under80 km/hrs.

Traction control and adaptive crouse control systems are common and pratical long tidinal active systems. Traction control helps limit tire slip in acceleration on slippery surfaces. Many of today's vehicles employ electronic controls to limit power delivery for the driver, eliminating wheel slip and helping the driver accelerate under control. TCS sensors measure differences in rotational speed to determine if the wheels that are receiving power have lost traction. When the traction-control system determines that one wheel is spinning more quickly than the others, it automatically "pumps" the brake to that wheel to reduce its speed and lessen wheel slip. In most cases, individual wheel braking is enough to control wheel slip. However, some traction control systems also reduce engine power to the slipping wheels.

Conventional cruise control systems simply maintain a preset speed. The driver presses a button to set the speed, and a servo or actuator on the throttle linkage maintains that speed until the driver steps on the brake, changes the speed setting up or down, or disengages the cruise control. An ACC system is a radar-based system that extends conventional cruise control and that is designed to monitor the immediate predecessor vehicle in the same lane, and to automatically adjust the speed of the equipped vehicle to match the speed of the preceding vehicle and to maintain a safe intervehicle distance. Cooperative ACC is a further enhancement of ACC systems that uses wireless communication technologies to obtain real-time information about the speed, acceleration, etc. of the preceding vehicle. Vehicles equipped with cooperative ACC can exchange the information much quicker and allow to set the safe minimum time headway as small as 0.5 s. Hence, with reduced headways between vehicles, the maximal traffic flow can be augmented even further these systems usually apply fuzzy control method [16] for control strategy system

Adaptive cruise control, by comparison, is a “smart” system that actively maintains a preset distance between vehicles rather than a preset speed. A laser or radar range finder sensor in the front of the vehicle measures the distance to the vehicle ahead. The driver then selects a distance that suits the driving conditions, and the system automatically maintains that distance as traffic speeds up and slows down. This makes adaptive cruise control much better than conventional cruise control for driving in heavy traffic, and it reduces the risk of rear ending another vehicle if the driver isn’t paying attention.



In this type of system, the conventional spring element is retained, but the damper is replaced with a controllable damper. Whereas an active suspension system requires an external energy source to power an actuator that controls the vehicle, a semiactive system uses external power only to adjust the damping levels, and operate an embedded controller and a set of sensors. The controller determines the level of damping based on a control strategy, and automatically adjusts the damper to achieve that damping. Various suspension system performnce and components are compared.

Conclousion In the last decadeintelligentcontrol andprotection systemisapplied tovehicles as aneffectivewayto increasesafety, performance andthe protectionlevel.In this regard,the most recenttechnologiesandsafetyprotection of vehicle active and passivecontrol systems, are provided and the effects of these systems on vehicle safety and performance are evaluated. These systems in various driving condition prevent vehicle crash, reduces damages and improve traffic flow.In this study, the effectiveness of a active control systems for vehicle safety was evaluated in various critical situations. The proposed control law is developed based on yaw moment and active front steering as well as minimizing the lateral deviation and heading error in relation to a given path and driver's inputs. The main advantiges of active and smart safety systems of vehicle are: 1- Accordingtotheroad networkandgeographical position, vehiclesposition identified in sever conditions and also are guided in theoptimal routes. 2- Vehicle speed and path are regulated in optimal way. 3- traffic flow is improved by considring lateral and longtudinal velocity and distance

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