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Saftey and Security of Automobiles

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Abstract: - Improving vehicle safety is a key strategy used in addressing international and national road casualty reduction targets and in achieving a safer road traffic system. Vehicle safety addresses the safety of all road users and currently comprises measures to help avoid a crash (crash avoidance) or reduce injury in the event of a crash (crash protection). Road traffic injuries are a major but neglected global public health problem, requiring concerted efforts for effective and sustainable prevention. Of all the systems that people have to deal with on a daily basis, road transport is the most complex and the most dangerous. Worldwide, the number of people killed in road traffic crashes each year is estimated at almost 1.2 million, while the number injured could be as high as 50 million – the combined population of five of the world's large cities. What is worse, without increased efforts and new initiatives, the total number of road traffic deaths worldwide and injuries is forecast to rise by some 65% between 2000 and 2020, and in low-income and middle-income countries deaths are expected to increase by as much as 80%. Improving vehicle safety is a key strategy used in addressing international and national road casualty reduction targets and in achieving a safer road traffic system. In the computer era the technology had grown leaps and bounds in almost all the fields. So many advanced vehicular safety equipment is available in the market to select from. This paper analyses about some of the advanced vehicular safety features, its implications and importance of having them in the vehicles and the need of making some mandatory.

Key Words: — Road Traffic Accidents, Accident prevention, Ignition Interlocks, Drunken Driving, Active and Passive Safety Features.

I. INTRODUCTION

With the development of the national economy, the people's standard of living got corresponding improvement, cars have been one of the indispensable traffic tools in many families. But as the number of cars increasing, the traffic accident rate due to various reasons is more and more high. Road traffic accident has brought us huge losses, has become a serious social problem in worldwide. One of the main types of accidents due to driver fatigue caused by rear-ends impact compared. In order to reduce the occurrence of such incidents. The vehicle active safety systems have been studied by Many scholars, the paper discusses the basic methods of distance measurement, Paper have studied the active safety systems for reversing and a reversing radar warning system is proposed based on the ultrasonic measuring principle, it achieved a collision when reversing. Hou has studied automotive active safety systems alarm methods and key technologies, Cheng has designed a vehicle active safety systems to avoid traffic accidents [8]. The author combines academic work on the basis of the above proposes radar technology-based automotive active safety systems. The vehicles can detection the distance between obstacles in real-time through this system (such as the driving vehicle stop or slow in front and side guardrail), and it also can give the warning messages to drivers to take action as soon as possible. In the meantime, when the real-time detection distance has lower than the limit value, the system would automatically start braking system to avoid car accidents. Automotive active safety systems based on radar range and speed. Selection of millimeter-wave radar, ultrasonic distance measuring sensor, and use AT89S52 as the core of the control system control, eventually design the car's active safety system.

II. AUTOMOTIVE SAFETY TECHNOLOGY

Karl Benz, a famous German engineer, invented the first car in history in 1886 and so far the reform and development of the automobile industry has lasted for nearly 130 years. In the meantime, automobiles have spread to all parts of the world and have rapidly penetrated into the social economy and people's daily life, and have become the most important and most common means of transportation for people. However, in recent years, due to the rapid popularization of automobiles, traffic safety has become more and more serious. The recent "World Disaster Report" pointed out that about 1.3 million people died in traffic accidents each year, and the number of injuries is up to 30 million. The world lost as much as $3,000 billion due to traffic accidents, of which up to two-thirds were lost in developing countries. Therefore, car safety performance is of great significance to occupant safety.

The R & D of automotive safety technology mainly starting from the whole, the first is the most important thing is to ensure the vehicle safety and comfortable situation as far as possible to prevent the occurrence of traffic accidents, the second is when the vehicle traffic accidents, to minimize the damage caused to the people in the car. At present, automobile safety is divided into two categories: active safety and passive safety.

A. Active Safety Technology

Active safety technology means the reasonable design of automobile and scientific structure in the automotive R & D and production process, using the very advanced technology in automobile industry, as far as possible to avoid or reduce the vehicle in normal driving sudden collision accidents, to improve the safety of their performance, to reduce the risk of a traffic accident then, to reduce the losses caused by the occupant. In recent years, active safety technology has become an important research object of R & D institutions of major automotive companies.

B. Chassis Active Control Technology

Vehicle active safety control is usually realized by active safety control of chassis. Electronic brake control is one of the most widely used technologies of chassis active control technology. Electronic stability control system (ESC) is considered to be one of the signs of vehicle active safety technology development, by comparing the running state of driver's intention and the actual vehicle system, reasonable distribution of longitudinal and lateral tire force, dynamic behavior and precise control of the vehicle, the driver will try to follow the road, reducing the probability of traffic accident them. According to the U.S NHTSA statistics, ESC can reduce 34% of bicycle accidents and 71% of rollover accidents; for SUV, it can reduce 59% of bicycle accidents and 84% of rollover accidents [6].

C. Security Early Warning Technology

The security warning technology detects the road environment information through the ultrasonic, vision and radar sensors, and analyzes the various information to remind and warn the driver, thereby reducing the occurrence of accidents. At present, the technology mainly through the use of visual sensors in the car, to detect the surrounding environment, auxiliary driver operation. With the development of vision technology, the security warning system based on monocular vision sensor will be more widely used in vehicles, and data fusion with other sensors will further improve the security of security warning technology.

III. PASSIVE SAFETY TECHNOLOGY

Passive vehicle safety technology refers to the automobile after the collision, using the protection devices to protect the people inside and outside the automobile as much as possible, to minimize damage. Today, most of the car mounted occupant protection devices include anti-collision body, pre tightening seat belts and airbags and so on.

A. Safety Belt

The seat belt was invented by Chaire L. Strath in 1935. It has been used as a must for automobiles. Seat belts are the most representative and major vehicle protection devices in the history of automotive passive safety system's research and development. In the process of automobile traffic accidents, it mainly uses the occupant restraint to absorb and buffer most of the energy generated by collision, so as to avoid the occupants hit into the cockpit or the happening of second collision, as much as possible to reduce occupant injuries and economic losses. According to NHTSA estimates, the use of seat belts reduced 45% of fatal injuries and 50% moderate to severe injuries to car front occupants, while 60% and 65% for light truck occupants. It saved the lives of 12802 people in the United States in 2014.

B. Airbag

Airbags were first invented by the Swedes. The first patent for American airbags was made in the 1950s, and some factories started to develop airbags in the 1970s. In 1972, General Motors took the lead in large-scale airbag field test. After the 1980s, more cars equipped with airbags, airbag technology tended to improve. In the 1990s, the number of airbag installations increased rapidly and there were many new technology products. The first airbag to prevent side impact was first developed by General Motors in 1996. In the 21st century the airbag has become a very common and vital safety device in automobiles. The airbag is an auxiliary occupant restraint system, which works with the seat belt to prevent occupants from being hurt by the car's interior trim. It mainly includes the controller, sensor, gas generator, airbag bag, warning lamp and other components. After the controller receives the signal, it immediately begins to analyze and judge whether to open the bag. It will immediately to send the ignition instructions if it is necessary. After receiving the ignition command, generator quickly generate enough gas to air filled gas until the airbags fully open now, and then contact with the soft passenger airbag, preventing the occurrence of two collision and car parts, reducing the traffic accidents caused by the occupant injuries and economic losses. The working principle is shown in Figure5.The startig airbag is

shown in Figure 6. Sensor: One of the most important components of a car's airbag, used to capture signals such as speed and acceleration when a car collides, and send the signal to the controller. Controller: Used to receive and analyze the speed or acceleration signal of the vehicle, and determine whether to send the ignition signal according to the analysis. In the case of collision, the more accurate judgment of the controller, and can accurately control the ignition time, the more the airbag can be opened correctly, to maximize the protection of the occupant. Gas generator: When the car collides, the gas generator quickly generates enough gas and immediately inflates to the airbag. The gas cannot be harmful to the human body, no pollution to the air, and the gas temperature not too high to avoid burning the human body. At the same time, it requires high stability and high reliability. Airbag bag: when the airbag expands, the explosive force is large and the temperature is high, which requires the airbag bag of high strength, good elasticity, thermal performance is strong, at the same time with high stability, aging resistance, small volume after folding, and can quickly expand, and the air bag cannot scratch the human face.

IV. New Technologies And Advanced Safety Features

Society thinks this Road Accident is a behavioral problem, rather than a problem that requires both changes to behavior and technology. But by applying the latest technologies we can save many persons from fatalities and major injuries. This doesn't mean that let people drive irresponsibly or as they wish but to save lives from some unintentional errors by providing latest innovative technologies. In recent years, there has been rapid and significant development of road transport technologies. At one extreme, the technology is now available for vehicles to drive safely in traffic independent of human input (though deployment is still some way off). At the other extreme, some quite simple technologies (such as seatbelt wearing detection) could dramatically reduce fatalities if compulsory in vehicles for all seats. Even in countries that have achieved very high rates of seatbelt wearing (95% or higher) through publicity and enforcement campaigns, unbelted drivers are considerably over-represented in fatality statistics. Technology is likely to be the most cost effective way to target the remainder of unbelted drivers whose lives could be saved.

Vehicle safety technologies primarily include on-board sensors that collect data and on-board units (OBUs) that issue warnings or take partial control of the vehicle. The advantage of these systems is that they can warn the driver of potential dangers or override to some degree the driver's control of the vehicle in attempt to avoid collisions. These benefits are only available to vehicles equipped with such on-board equipment. Some unresolved issues concerning these systems include the need to ensure reliability and establish system standards to avoid driver confusion and potential dangers due to variations in commercially available OBUs. Moreover, it is important to make drivers aware of the extent to which the system is able to reduce danger, in order to avoid excessive reliance on OBUs. Safe use of in-vehicle technologies can be ensured by:

- User-friendly design, taking into account human limitations (distractibility, limited memory, field of view, attention, etc).
- Integrated solutions (e.g. automatically turning down the radio when a phone call comes in or turning off the computer when the vehicle is moving).
- Adaptive solutions (e.g. adapted to driving conditions).
- Standardized testing procedures of the total task load (visual, cognitive manual).

A. Active and Passive Safety Features

The terms "active" and "passive" are simple but important terms in the world of automotive safety. "Active safety" is used to refer to technology assisting in the prevention of a crash and "passive safety" to components of the vehicle (primarily airbags, seatbelts and the physical structure of the vehicle) that help to protect occupants during a crash. Active safety features, like anti-lock braking systems, traction control and electronic brake distribution, are meant to avoid an accident. Passive safety features, like in-built crumble zones in the monologue body shell which deform in a head-on collision to absorb the energy of the oncoming vehicle, are being to protect the driver and passengers inside the vehicle when an accident occurs despite the functioning of the various active safety systems. Airbags, side impact beams in the doors and collapsible steering columns are other examples of passive safety systems. During the past decade car safety technology has changed in emphasis, according to Russ Rader of the Insurance Institute for Highway Safety, or IIHS. That change has been from "passive" safety technology to "active" technology. In the past, safety features have been about protecting people in crashes. Now it's about preventing crashes. Six active safety technologies that are either proven or do hold promise:

*Electronic stability control or ESC***:** the biggest game changer in auto safety in years. ESC is built on ABS. Sensors determine when the vehicle isn't going where its pointed, and

uses the ABS to brake the appropriate wheels to get it back on course.

*Lane departure warning***:** Recognizing when the vehicle is unintentionally drifting out of its lane, it alerts the driver. Sophisticated systems, like that on the 2011 Infiniti M, will even nudge the vehicle back on course. This system will have a similar impact on accident reduction as roads with warning rumble strips dividing their lanes. On such roads, there has been a 25 (percent) to 30 percent decrease in head-on, sideswipe and run-off-the-road accidents.

*Collision warning with automatic braking***:** Using radar similar to that for adaptive cruise control, this system senses when the traffic ahead is slowing or stopped. It alerts the driver with an audible warning and will bring the car to a stop if he fails to react.

*Blind-zone warning***:** Sensing when another vehicle is approaching your vehicle's flanks, this system alerts you with a warning light and/or audible alarm. One factor that might reduce its effectiveness is that when the warning light is on the outboard mirror, some drivers simply don't use.

B. Advance Safety Features

There are also some more sophisticated advanced safety features available in markets which are normally fixed in costlier cars like: Infrared night vision systems to increase seeing distance beyond head lamp range.

- Adaptive high beam which automatically and continuously adapts the headlamp range to the distance of vehicles ahead or which are oncoming.
- Adaptive head lamps swivels headlamps around corners
- Reverse back up sensors, which alert drivers to difficult-to-see objects in their path when reversing
- Back up camera
- Adaptive cruise control which maintains a safe distance from the vehicle in front
- Lane departure warning systems to alert the driver of an unintended departure from the intended lane of travel.

V. 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. In this paper, the current automotive safety technology is summarized; in addition, in view of the bad weather vehicle safety problems, a new airbag system is proposed, and its working mode is described. The effect of the new air bag needs to be tested by experiments. In the future, its' safety will be analyzed by the way of physical simulation. It means how this air bag copes with the environment of rainstorm and the roller accidents which lead to high fall accidents, will be analyzed. Then, further improvements will be made according to the analysis results.

REFERENCES

[1]. Xiao-Yang Wang, Yi-Hang Jiang, Ren-Bo Li and Ming-Zhang Chen3. “Automobile safety technology and its improvement”.

[2]. Y.Wang, and Q.Zhang “Design of an Active Automotive Safety System”.

[3]. T. Sivakumara and R. Krishnarajb “A Study on Application of Advanced Automobile Safety Features and their Implication on Road Traffic Accidents and Road Fatalities”.