Automobile Safety Technology and Its Improvement

Ankit

Student, Dronacharya College of Engineering, MDU, Rohtak, India.

Abstract: - In the concept of the safety technology with the development of society, and the sharp increase in car sales, traffic accidents have become increasingly frequent and serious. At the same time, with the rapid development of science and technology, automotive technology has also been rapidly improved, automotive safety technology gradually involved in all aspects of the car. This paper introduces the main automotive safety technology at present, proposes a kind of airbag system, and describes its specific working methods.

Key Words— *Automobile Safety, Traffic accidents, Airbag system.*

I. INTRODUCTION

Automobile safety is the study and practice of design, construction, equipment and regulation to minimize the occurrence and consequences of automobile accidents. Road traffic safety more broadly includes roadway design. One of the first formal academic studies into improving vehicle safety was by Cornell Aeronautical Laboratory of Buffalo, New York. The main conclusion of their extensive report is the crucial importance of seat belts and padded dashboards. As vehicle safety features are continuously evolving and improving, exciting new breakthrough technologies are being integrated into our vehicles. Our cars are becoming safer to drive and more secure when accidents happen. Vehicle safety technologies are intended to maximize the efficiency of the driver, while protecting them and passengers in the event of a collision. If you are in the market for a new or used car, these safety and technology features should be understood and taken into consideration.

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.

III. CAR SAFETY FEATURES

As automated vehicle safety technology has the potential to save lives, the National Highway Traffic Safety Administration (NHTSA), the Insurance Institute for Highway Safety (IIHS), and the Department of Transportation (DOT) all work to support the development of such safety features.
The following are some process of vehicle safety features and technology.

A. Seat Belt

According to nearly all research and authorities on the subject of vehicle safety, the seatbelt and technology behind it is your number one defense against severe or fatal injuries resulting from automobile accidents. 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

International Journal of Progressive Research in Science and Engineering
Volume-1, Issue-3, June-2020
www.ijprse.com

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[7-8]. The use of seat belts is shown in Figure.1.
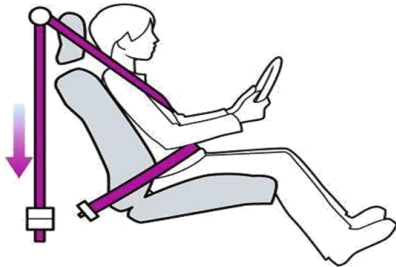

Fig.1. Seat belt

B. Traction Control System

This system regulates the acceleration of your vehicle to stop your wheels from spinning on roads with slippery conditions.

This technology utilizes the same wheel-speed sensors employed by ABS to reduce engine power to the slipping wheels.

C. Forward Collision Warning

This system utilizes radar, cameras, laser, or a combination of such technologies to scan the road ahead and determine if the distance to an object or a vehicle is closing too quickly.

When trouble is detected, the system can warn the driver using a visual, audible, or a vibrating feedback.

D. Automatic Emergency Braking

This is safety technology which uses sensors, radar, and cameras that alert a driver of an imminent crash, and automatically activates the vehicle's brake system, helping them use the maximum braking capacity of the car.

E. Air Bag System

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 Figure.2.

Fig.2. The working principle of air bag

F. Accident Mitigation, Safety Features, And Common Senses

When purchasing a new vehicle, it is essential to know which safety and accident mitigation features it comes equipped with. For inexperienced or elderly drivers, these features can especially the mean difference for the safety.

G. Remote Vehicle Shutdown

Remote Vehicle Shutdown refers to a system which helps the user to enable the option of remotely shutting down the vehicle, to which it is connected, using radio pulses. The technology was intended for police, military and security use in order to help lower down the damage that can be caused due to dangerous driving. With the help of this technology, one can remotely find and disable stolen vehicles.

Remote vehicle disabling systems can provide the authorized users at remote locations, the ability to prevent an engine from starting, prevent movement of a vehicle, and to stop or slow an operating vehicle. It also allows the dispatcher or other

authorized personnel to gradually decelerate a vehicle by downshifting, limiting the throttle capability, or bleeding air from the braking system from a remote location. Remote vehicle shutdown systems can also be integrated into a remote panic and emergency notification system. In case of an emergency, the driver can send an emergency alert by pressing a panic button.

H. Network Traffic Alerts

For the protection of critical infrastructures against complex virus attacks, automated network traffic analysis and deep packet inspection are unavoidable. However, even with the use of network intrusion detection systems, the number of alerts is still too large to analyze manually. In addition, the discovery of domain-specific multi stage viruses (e.g., Advanced Persistent Threats) are typically not captured by a single alert. The result is that security experts are overloaded with low-level technical alerts where they must look for the presence of an APT. In this paper we propose an alert-oriented visual analytics approach for the exploration of network traffic content in multiple contexts. In our approach CoNTA (Contextual analysis of Network Traffic Alerts), experts are supported to discover threats in large alert collections through interactive exploration using selections and attributes of interest.

IV. NEW AIRBAG SYSTEM WORKING

New developments in Airbag Technology now cushion occupants from more areas of the vehicle and increase safety in a crash. From an extrication perspective, new technology creates a new layer of challenges for rescuers although there are developments that reduce the likelihood of someone being harmed in a rescue scenario. We will look at some of these interesting developments and see why they are being introduced.

The airbag is best used in combination with wearing a safety belt, and can prevent injuries and fatalities in front-end collisions. Whilst traditionally designed to provide a cushion for adult-sized front seated passengers in a crash, airbags may be quite dangerous for the young, frail and elderly and pose a real challenge for rescuers. When a crash victim needs to be extricated from a vehicle un-deployed airbags can go off during the rescue and cause serious harm to victim and/or rescuer.

The working principle of the new airbag system is shown in figure.7. It is found that the greater the water level is, the greater the force required to escape the door when escaping. Therefore, the shorter the escape time is, the greater the probability of success is. When water depth is 70-80cm away from the ground, it is the critical depth of vehicle escape.

Therefore, in the rainstorm environment, the water level rises rapidly, and the judgment of water level is the key. The airbag system installs pressure sensors at the bottom of the car to detect the water depth. When the water level is higher than the critical water depth, the car bottom and front and rear side airbags are automatically started to protect the personnel safety.
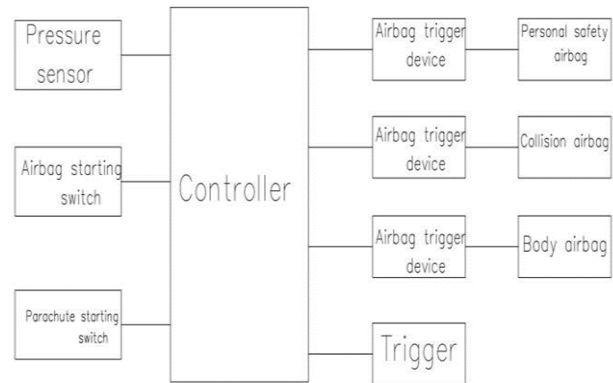

Fig.3. New air bag system with working principle

When the car is in danger of collision, that is, when the impact force (deceleration) exceeds the set value, the signal is produced. After starting the system, the four positions airbag is inflated, and the crew airbag system also works.

In addition, when the car has a rollover or falling danger, the system senses the inclination parameters of the vehicle through the vehicle interior attitude sensor. When the angle reaches the critical point, the starting signal is generated. All the airbags inflate and release the four angles parachute, which reduces the impact force of the car landing, and protects the personnel safety as much as possible. To sum up, the airbag device has a variety of starting methods, including water pressure passive start mode, the active start mode of rainstorm, traffic accident initiation mode, high-altitude falling mode, etc., to adapt to the dangerous situation of the car in different environmental conditions Water pressure passive start mode: when the vehicle is immersed in water for a certain depth, water pressure reaches a critical value, the water pressure sensor transmits a signal to the MCU, MCU control car airbag, car using buoyancy to float in the water. The active starting mode of the rainstorm: when the rain enters the car and the car has people or someone finds that the car has been immersed in danger, it starts.

The starting system is the radio remote start system. After starting the system, the airbag system of the car bottom and the system of the four position airbag begin to work The traffic accident start mode: when the car driving start system in a relatively flat area of traffic accident. The collision

analysis control is connected to the gate element to control the system. Analysis of the essence of control when the collision impact force (deceleration) signal exceeds the set value, the system. After the start of a four airbag occupant work the airbag system is working.

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]. World Health Organization. World report on road traffic injury prevention [R]. Geneva: WHO, 2004.

[2]. Wang Xiaojing. The review of ITS for traffic safety [C]// 2008 Fourth China Intelligent Transport Annual Meeting Thesis, 2008-09.

[3]. Wiezbicki.T, Recke.L,Abramowicz.W, Gholami.T., J Huang. Stress Profiles in thin-walled prismatic columns subjected to crush loading 11. Bending, computers and structures. Vol.51. No.6, P625-64.

[4]. SUN Yueting, XU Xiaoqing, XU Chengliang, et al. Elastomeric cellular structure enhanced by compressible liquid filler [J]. Sci Rep, 2016, 6: 26694.

[5]. SHI Xiangnan, CAO Libo, Reed M P, et al. Effects of obesity on occupant responses in frontal crashes: a simulation analysis using human body models.