Active-Passive Integration Offers Safety Synergy

Joe Gaus, Continental Automotive Systems - April 29, 2005

In 2003 there were about 6.3-million passenger vehicle crashes accounting for three million injuries and more than 42,000 fatalities. Of these 6 million-plus crashes, 253,000 were rollovers causing almost 60,000 serious injuries. Keep in mind that 20% of all fatalities involve rollovers. The best way to diminish injuries and fatalities is to avoid the accident in the first place.

The US Department of Transportation has set a goal to reduce the number of fatalities from 1.5 per million vehicle miles traveled to 1.0 by 2008. But if nothing changes in the way we view automotive safety, fatalities will actually increase by 50,000 per year. We must shift the paradigm to attain the goal.

Studies show that driver behavior remains the most critical challenge to enhancing road safety and is one of the roadblocks to reducing the number of driving fatalities. This is an important goal since society always benefits when our population stays healthy and productive.

Modern Safety History
With the introduction of anti-lock brakes in the early 1980s and electronic stability control (ESC) and traction control a few years later, automobiles were finally providing a means to keep drivers from getting in to accidents—not just protecting them after the fact.

Prior to these developments auto suppliers and manufacturers focused primarily on safety devices that would provide protection to the occupants once an accident was underway. Ford became the first mass-production manufacturer in 1956 to market safety by offering front lap belts as an option along with a padded dash, less protrusive instrument panel controls, and a "deep dish" steering wheel. They also added Life Guard door latches to keep doors from opening in the event of a crash.

More recently the evolutional development of safety items such as three-point seat-belts, airbags, and better roof strength has contributed greatly to saving the lives of many crash victims. Once an accident is happening, these measures help in minimizing injury but do nothing to keep a car from spinning off the road or rear-ending the vehicle ahead. With modern technologies, many accidents could be avoided completely.

Preventive Safety Features
Today many leading automotive manufacturers recognize the importance of a new breed of safety features that prevent crashes and rollovers by anticipating a dangerous situation. Continental Automotive Systems has developed some of the most advanced active safety systems available today. These systems can intervene to keep a vehicle from sliding out of control, to stop more quickly in an unstable situation, and keep driven-wheels from slipping on wet or slick surfaces.

One of the major projects now under way at Continental is a unique method of connecting a number
of safety innovations under a single system, keeping all of these advanced technologies working in unison. The project is known as APIA, or Active Passive Integration Approach. You might say it totals more than the sum of its parts when working as a single system.

The heart of the APIA system is the danger control module. It recognizes a potential crash and introduces staged measures to protect the vehicle occupants in out-of-the-ordinary on-road situations. Pre-crash sensors are a vital part of the APIA system that recognize and evaluate a dangerous situation or potential collision before it occurs.

1 (green)—Designates long range infrared or radar; used for adaptive cruise control at highway speed as well as stop and go (when combined with mid-range sensor)
2 (yellow)—Camera-based, mid-range sensor for collision mitigation for pre-crash sensing
3 (pink)—Short range lidar, radar, or camera for park assist and back-up
4 (blue)—Camera-based for blind spot detection, lane changing support, and side impact sensing

After pre-crash systems react, passive restraint systems, such as airbags and seat belt tensioners, will activate according to need, based on information from sensors. APIA is an intelligent 'umbrella' system to help avoid injury through networking of both active and passive safety.

"Continental engineers have succeeded in networking active and passive safety systems in an intelligent manner," says Dean McConnell, director of product strategy, Electronic Brake & Safety Systems. "This is achieved by linking the subsystems such as anti-lock brakes, occupant safety, environmental sensors and in the future, the steering. The overall idea is to avoid accidents and to prevent injury. The environmental sensors constantly analyze the traffic situation. If an impending hazard is detected, a finely staged response of safety measures will be initiated and adapted to the current accident risk."

Since the laws of physics will often override the best technologies, safety features such as seat-belts and airbags will continue to play an important role in keeping occupants safe, but the number of accidents and injuries could be greatly reduced by the APIA system. **Active and Passive**

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Safety features in today's vehicles can be divided into two major categories—active and passive safety. Both areas are monitored by APIA.

Active safety can be described as the safety qualities of a vehicle that interact with or are controlled by the driver that can help avoid a crash or minimize the effects of a crash. Examples include anti-lock braking, traction control and electronic stability control systems.

Examples of passive safety protect passengers after an impact happens, such as structural crashworthiness, an energy absorbent steering column, seat belts, and airbags.

The APIA program links these and other systems electronically and uses environmental sensors to trigger one or more of them in to action. Both active and passive systems can work in tandem as
Sensing for pedestrian protection A fully functional APIA vehicle is currently being tested today. After being test driven by customers and the press, the APIA-equipped vehicle has shown in real-world terms just how advanced and important this system can be to accident avoidance. Future APIA Continental engineers are now in the testing stages of ESC II, or Electronic Stability Control II. This next-generation system takes APHIA and ESC a step further by monitoring active steering control and can be used with an active suspension to provide even more effective vehicle stability. This system is based on near-future products and will begin showing up in next-generation vehicles. The overall importance of the Active Passive Integration Approach goes beyond just providing another stage in automotive safety. APIA provides a unique way of looking at how we approach vehicle safety, a method that can save lives by prevent accidents, or lessening the severity of a crash. This can mean improving the quality of life when an accident is avoided and ultimately helping to improve insurance and medical costs to society. APIA shifts the paradigm and will change the way we look at all future automotive safety. Avoiding an accident altogether improves everyone's lives.

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