TASKING

Standards-based ADAS Compliance Drives Auto Safety

INTRODUCTION:

Consumers today are placing higher importance on the less tangible features of the cars they buy, especially when it comes to safety systems. Advanced driver assistance systems (ADAS), such as crash avoidance, lane detection, and image recognition that can identify pedestrians, are rapidly becoming common features (as shown in Figure 1). Powertrain control modules (PCMs) electronically control the engine, transmission, driveline, and other functions associated with a vehicle's movement. As technology advances, it won't be long before cars can see around corners using information received from other vehicles on the road and autonomously driving cars become commonplace.

But the reliance on electronics such as ADAS and PCMs increases the potential for serious injury, and even death, in case such a system malfunctions. Imagine if a car suddenly slams into reverse at 70 mph, or stepping on the brake accelerated the car, or if the sensors indicated a left turn was safe but the car turns right instead. Automakers must take every precaution to ensure that scenarios like these never happen. Tightly integrated hardware and software components that meet the rigorous industry safety standards are one way to bolster automotive safety. Standards-based design and development are necessary to bring consistency and reliability to these ever-more complex systems. And ASPICE® certification offers clearly defined measures for more precise understanding of software compliance issues. Any safety-relevant software or electronic component should be ASPICE certified to ensure the highest software quality.

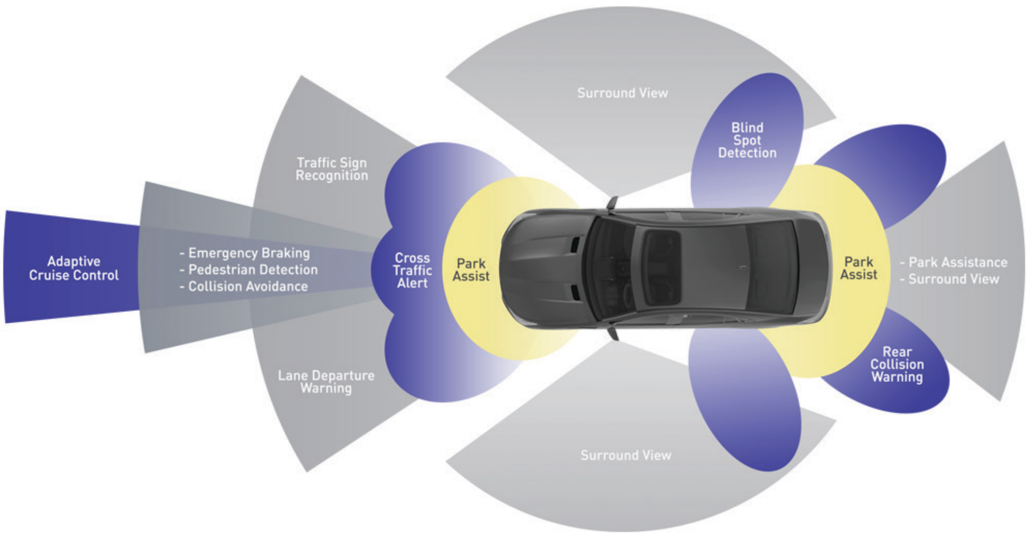

Figure 1. Advanced driver assistance systems (ADAS), such as automated parking, braking, and crash avoidance, play an increasingly important part in vehicle safety.

AUTO SAFETY RIDES ON ADAS AND PCM RELIABILITY

Electronic components are playing an increasingly crucial role in improving vehicle durability, safety, and environmental impact. ADAS functions, such as crash avoidance and lane detection; PCM functions, such as fuel injection and transmission control; as well as other safety-relevant functions, are all controlled by tightly integrated hardware and software technologies using electronic components. The future of autonomously driving vehicles relies on the quality of these components. Even the infotainment system, while not subject to the same safety requirements, relies on electronics and is governed by automotive standards.

These electronic components enable precise performance control through software algorithms. With every new design, vehicles incorporate more electronics, such as mobile phone integration and related software in order to remain competitive. While not as obvious as the tangible parts of the vehicle like leather seating and wood trim, these technologies are an integral part of modern cars (Figure 2).

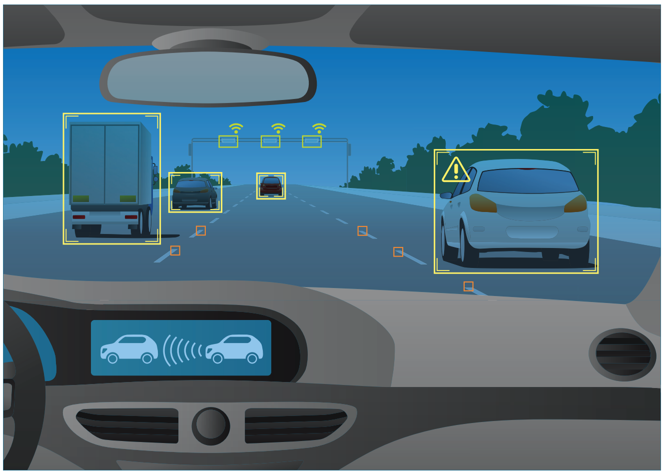

Figure 2. Advanced driver assistance systems (ADAS), such as crash avoidance, require tightly integrated electronic and software components.

As automakers shift from individual driver functions toward higher levels of vehicle autonomy, especially vehicle-to-infrastructure (V2X) communications in which cars communicate with each other, the complexity of ADAS grows exponentially. Stephen Longden, an ITS and telematics specialist with Secured by Design (SBD), predicts that cars will eventually be in constant communication with the vehicles around them, like bees in a swarm.(1) PCMs are also becoming more complex—especially in light of new environmental regulations that specify lower emissions and better fuel efficiency. These advances present challenges for system design and management. Failures of these systems can produce fatal results, including accidents resulting in death. Hence, safety is the highest priority when designing and maintaining ADAS and PCM features.

CONNECTED COMMUNICATION DRIVES THE FUTURE OF ADAS

Advanced driver assistance systems (ADAS) make driving safer and easier by automating, enhancing, and adapting features such as collision warnings. ADAS technology is changing rapidly and becoming more sophisticated. The next generation of ADAS technology will use computationally intensive algorithms and machine learning applications, resulting in increasingly complex solutions, such as object identification, map localization, and self-driving cars. ADAS technology relies on the following smart, connected communication technologies:

- **Vehicle-to-vehicle (V2V) communication**: Data collected from vehicles on the road can transmit important information about conditions, traffic, and other safety concerns to other ADAS.
- **Vehicle-to-infrastructure (V2I) communication**: Using analytics at the edge, transportation authorities can use collected data to adjust or improve road safety and efficiency in real-time, or to prioritize future projects.
- **Joint V2V/V2I (V2X) communication**: V2X transmits and receives information about the vehicle's speed, direction, brake status, and size between other vehicles and infrastructure. V2X includes long-distance communication, which allows ADAS to process and adjust to what drivers and in-vehicle sensors cannot see, such as an accident around a curve.

V2X communication offers the potential for cars to move faster, with less distance between them, easing congestion and improving fuel efficiency and safety.

CERTIFICATION ENSURES SOFTWARE SAFETY COMPLIANCE

Meeting functional safety standards in ADAS is critical. Through compliance, development silos are eliminated, making it easier for software and hardware developers to collaborate through a unified standard development process. With standards-based development, ADAS can be simplified, and risks are more easily managed. Updates are also automated for a more integrated execution across platforms and systems, which results in improved safety for drivers. Leading automakers are adopting industry-wide quality standards for ADAS through the following methods:

- **ISO 26262.** International Organization for Standardization (ISO) developed ISO 26262—adapted from the more general International Electrotechnical Commission (IEC) 61508—for functional safety of the vehicle's electrical systems. This includes risks that might arise from hardware or system faults, software development, or during production. ISO 26262 prescribes properties and criteria that must be fulfilled as a part of functional and technical safety. This standard defines several Automotive Safety Integrity Level (ASIL) classifications, from ASIL-QM (no safety ramifications) to ASIL-D (the most stringent safety requirements). At ASIL-D, which governs both ADAS and PCMs, if something goes wrong, the error must be detected and the system brought into a safe state within a specific time period.
- **IEEE 2020.** Institute of Electrical and Electronics Engineers (IEEE) 2020, currently in draft form, specifies methods and metrics for measuring and testing the quality of automotive images to ensure consistency and create cross-industry reference points. This is a future-looking standard that is not yet published, but will have an important impact on ADAS functions that rely on cameras, image processing, computer vision, and other vehicle perception technologies.
- **ASPICE.** The Automotive Software Process Improvement and Capability dEtermination (ASPICE) certification is used as a compliance model that helps automakers improve productivity and comply with standards for integrating subsystems, platform strategies, and distribution. ASPICE provides an individual capability rating for each process, giving manufacturers a more precise understanding of compliance issues. It includes:
    - ◊ **Process dimension.** Based on an extended version of the ISO 12207 standard, this dimension focuses on automotive-specific processes.
    - ◊ **Process capability dimension.** This dimension corresponds to the six process capability levels using an ISO 15504-compatible assessment model, defined as follows (shown in Figure 3):
        - § **Level 0**. Not all plans, specifications, design documents, test descriptions, and other electronic and software lifecycle documentation exist, resulting in not all processes being carried out.
        - § **Level 1**. All important lifecycle documentation is current and available.
        - § **Level 2.** All activities within the lifecycle are systematically planned and tracked.
        - § **Level 3.** Uniform guidelines are in place for the entire organization.
        - § **Level 4.** Processes are measured statistically.
        - § **Level 5.** Processes are optimized.

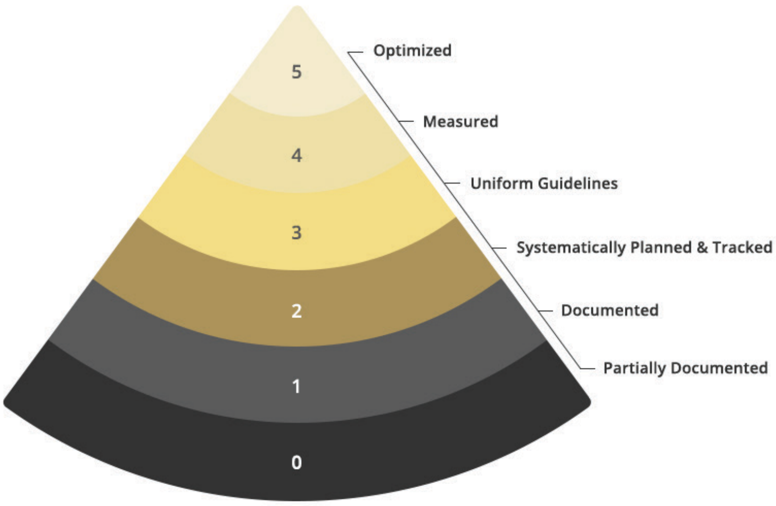

Figure 3. ASPICE compliance can be measured in levels of product lifecycle maturity.

Automakers evaluating ADAS solutions and components should look for Level 2 ASPICE certification or higher to ensure that their safety-relevant tools, like compilers, meet the necessary safety requirements and are compliant with standards.

SAFETY STANDARDS PAVE THE WAY FOR TECHNOLOGY ADVANCES

The future of the automobile is evolving quickly, and ADAS features are at the heart of safety and customer satisfaction. As a result, the use of electronics in the automotive industry, such as ADAS technology and advanced PCMs, is changing rapidly and becoming a highly sophisticated part of the auto experience. In the near future, cars will be able to recognize hazardous situations before the driver does, and self-driving cars will be common on the road. But these technology advancements can pose safety risks if not properly designed and managed. Standards-based software and hardware that meet the ISO 26262, IEEE 2020 standards, and that are ASPICE-certified provide a solid foundation for meeting automotive safety requirements.

REFERENCES

(1) "The Role of V2X in ADAS", http://deviceguru.com/v2x-communications-advanced-driver-asistance-systems/

MORE INFO...

ISO 26262

IEEE 2020

ASPICE