Press release

December 5, 2019
PI 11049 BBM Fi/af

Camera-based life-saver: Bosch helps cars keep an eye on their passengers

More safety and convenience thanks to artificial intelligence

- The interior monitoring system detects driver drowsiness and distraction, and provides driving assistance
- Harald Kroeger: “Bosch is using cameras and AI to turn the vehicle into a life-saver.”
- Bosch is developing a new car-driver symbiosis for automated driving
- Over the next 20 years or so, new safety technology that e.g. warns drivers about drowsiness and distraction is expected to save 25,000 lives in the EU

Stuttgart, Germany – Microsleep, distraction, a seatbelt left undone – many things that happen inside a vehicle can have far-reaching consequences. To avert critical driving situations and possibly also accidents, it is planned that cars will in the future use their sensors not simply to monitor the road but also the driver and other passengers. For this purpose, Bosch has developed a new interior monitoring system featuring cameras and artificial intelligence (AI). “If the car knows what its driver and occupants are doing, driving will become safer and more convenient,” says Harald Kroeger, a member of the Robert Bosch GmbH board of management. The Bosch system may go into production in 2022. In that year, the EU will make safety technology that for example warns drivers of drowsiness and distraction a standard feature in new vehicles. The EU Commission expects that, by 2038, their new safety requirements for vehicles will save more than 25,000 lives and help prevent at least 140,000 severe injuries. By keeping an eye on what is happening inside the car, it is hoped that a fundamental problem of self-driving cars will be solved. If responsibility for driving is to be transferred to the driver again following an automated drive on the freeway, say, the car needs to be sure that the driver is neither sleeping, nor reading the newspaper, nor writing e-mails on their smartphone.

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A smart camera constantly monitors the driver

At 50 kph, a vehicle will cover 42 meters completely unsupervised if the driver dozes off or looks at their smartphone for just three seconds. Many people underestimate the associated risk. International studies state that nearly one in ten accidents are caused by distraction or drowsiness. This has prompted Bosch to develop an interior monitoring system that detects and alerts to this danger and provides driving assistance. A camera integrated in the steering wheel detects when drivers' eyelids are getting heavy, when they are distracted, and when they turn their head toward their passenger or the rear seats. Thanks to AI, the system draws the right conclusions from this information: it warns inattentive drivers, recommends a break if they are getting tired, or even reduces the speed of the vehicles – depending on the automaker's wishes, and also on legal requirements.

"Cameras and AI will turn the vehicle into a life-saver," Kroeger says. To achieve this, Bosch engineers have used intelligent image-processing algorithms and machine learning to teach the system to understand what the person in the driving seat is actually doing. To take the example of driver drowsiness, the system is trained using recordings of real driving situations and, on the basis of recordings of eyelid position and eye-blink rate, learns how tired the driver really is. This allows it to give an alert that is appropriate to the situation, and to use the driver assistance systems to intervene. Warning systems that sound the alert in the case of distraction and drowsiness will be so important in the future that NCAP, the European New Car Assessment Program, will include them in the roadmap for the Euro NCAP assessment for vehicle safety by 2025. On the subject of monitoring, only the software in the vehicle itself evaluates the information provided by the interior monitoring system – the information is neither saved nor passed on to third parties.

Like a relay race: responsibility for steering passes from car to driver and back

At the latest when cars start driving automatically, it is obvious how important it is that they understand their drivers. Once driving is automated, cars will drive along freeways without driver intervention. However, they will also have to be able to hand back control to their drivers in tricky situations such as construction zones, or when the exit ramp is drawing near. Drivers have to be able to safely take the wheel again at any time during the automated driving phase, and the camera makes sure they don't fall asleep. If their eyes remain closed for a prolonged period, an alarm is sounded. The system also interprets camera recordings to establish what drivers are currently doing, and how ready they are to respond. The transfer of driving responsibility is then timed accordingly. "Bosch driver observation will be essential for safe automated driving," Kroeger says.

When the car keeps its camera eyes open

But the new Bosch system keeps its eye not only on the driver, but also on all the other passengers, whether next to or behind the driver. For this purpose, a camera mounted above or below the rear-view mirror monitors the entire passenger compartment. It notices whether children on the rear seats have carelessly unfastened their seat belts, and warns the driver. If someone sitting in the back is leaning too far forward, at an angle, or with their feet up on the seat next to them, the airbags and belt tensioner will not be able to protect them properly in an accident. The interior monitoring camera can tell what position they are sitting in and set the airbags and belt tensioner to ensure the best possible protection. The interior monitoring system also prevents the passenger-seat airbag from being deployed if a baby's carrycot is on the seat. On the subject of children, it is a sad fact that parked vehicles can be a death trap for them. In the United States in 2018, they claimed the lives of more than 50 children (source: KidsAndCars.org), either because they had been left in the car for a short while or had clambered in unnoticed. The new Bosch system can recognizes this danger, and warn parents in a flash by sending a message to their smartphone. In an emergency, it also can alert the emergency services. As the Hot Cars Act currently being debated in the United States shows, legislators are interested in technology solutions to address this challenge.

A camera for more convenience

The new Bosch system also means more driving convenience. The interior monitoring camera can tell who is about to drive and adjust the rear-view mirror, seating position, steering-wheel height, and infotainment system to preset personal preferences. And the camera can also be used for eye- and hand-gesture control of the infotainment system.

Press photos: #2895919, #2895920, #2895921, #2895922, #2895923, #2895924, #2898068

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Bosch at CES 2020:

- **PRESS CONFERENCE:** In Ballrooms B, C, and D, Mandalay Bay Hotel, Las Vegas **South Convention Center, Level 2**, from **9:00 to 10:30 a.m. local time on Monday, January 6, 2020.**
- **BOOTH: Tuesday to Friday, January 7–10, 2020**, in the Central Hall, booth #12401

- **FOLLOW** the Bosch CES 2020 highlights on Twitter: **#BoschCES**
- **PANELS WITH BOSCH EXPERTS:**
  Wednesday, January 8, 2020, 10:15 to 11:15 (local time)
  Event on the subject of "Growth of Apprenticeships for 'New Collar' Jobs" with Charlie Ackerman, Senior Vice President of Human Resources, Las Vegas, South Convention Center

Mobility Solutions is the largest Bosch Group business sector. In 2018, its sales came to 47.6 billion euros, or 61 percent of total group sales. This makes the Bosch Group one of the leading automotive suppliers. The Mobility Solutions business sector pursues a vision of mobility that is accident-free, emissions-free, and fascinating, and combines the group's expertise in the domains of personalization, automation, electrification, and connectivity. For its customers, the outcome is integrated mobility solutions. The business sector's main areas of activity are injection technology and powertrain peripherals for internal-combustion engines, diverse solutions for powertrain electrification, vehicle safety systems, driver-assistance and automated functions, technology for user-friendly infotainment as well as vehicle-to-vehicle and vehicle-to-infrastructure communication, repair-shop concepts, and technology and services for the automotive aftermarket. Bosch is synonymous with important automotive innovations, such as electronic engine management, the ESP anti-skid system, and common-rail diesel technology.

The Bosch Group is a leading global supplier of technology and services. It employs roughly 410,000 associates worldwide (as of December 31, 2018). The company generated sales of 78.5 billion euros in 2018. Its operations are divided into four business sectors: Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology. As a leading IoT company, Bosch offers innovative solutions for smart homes, smart cities, connected mobility, and connected manufacturing. It uses its expertise in sensor technology, software, and services, as well as its own IoT cloud, to offer its customers connected, cross-domain solutions from a single source. The Bosch Group's strategic objective is to deliver innovations for a connected life. Bosch improves quality of life worldwide with products and services that are innovative and spark enthusiasm. In short, Bosch creates technology that is "Invented for life." The Bosch Group comprises Robert Bosch GmbH and its roughly 460 subsidiary and regional companies in over 60 countries. Including sales and service partners, Bosch's global manufacturing, engineering, and sales network covers nearly every country in the world. The basis for the company's future growth is its innovative strength. At nearly 130 locations across the globe, Bosch employs some 68,700 associates in research and development.

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