

Guardian Backup-driver Monitoring System

TAKE THE SAFER ROAD TOWARD
AUTOMATED DRIVING

AN OBVIOUS SOLUTION IS TO SUPPORT THE BACK-UP HUMAN DRIVER WITH A SYSTEM THAT PROVIDES RELIABLE AND CONTINUAL MONITORING AND TRAINING IN REAL-TIME.



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Automated driving will make driving easier, more comfortable, and eventually, safer. Entrusting the driving task to a computer will become a reality, but the journey will be gradual, complex, and potentially dangerous.

Automated vehicles will need to operate safely and reliably in real-world conditions. Testing automated vehicles in these same conditions, on public roads, is critical for effective research and development, but there are obvious risks that must be managed along the way. A common and prudent practice, as automated driving technology is tested and refined, is to have a human backup-driver who does just that – backs up the yet imperfect automated driving system to help assure safe operation of the vehicle at all times.

In order to gather enough data and “learn” to drive, automated vehicles need to operate in automated driving mode for long periods of time. As the technology improves, the number of unexpected, though potentially dangerous events that the car will not be able to reliably respond to is becoming increasingly rare. So, how can humans be trained to stay alert, engaged and aware when they are rarely, but urgently, needed to intervene in the driving task? Humans get bored, distracted, and tired. Recent reports by the U.S. NTSB (National Transportation Safety Board), regarding autonomous and semi-autonomous vehicle related accidents and safety, have pointed to this issue and have recommended driver monitoring as a mitigation strategy.

With years of experience in delivering driver monitoring safety solutions for commercial and industrial fleets, as well as in passenger car applications, Seeing Machines has developed a product designed specifically to meet the requirements of automated driving research fleet owners and operators, with the goal of safe innovation and on-road testing of automated driving technology.

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The **Guardian Backup-driver Monitoring System** (Guardian BdMS) leverages Seeing Machines' automotive-grade FOVIO driver monitoring technology in a convenient retrofit system for SAE Level 3 to Level 5 test vehicle fleets.

The primary function of the camera-based BdMS system is to track the backup-driver's face and eyes during on-road automated or semi-automated vehicle testing, report driver state information (e.g. on-road, or off-road attention state), and identify distraction events of increasing severity (e.g. insufficient driver attention to the road scene).

Driver state and video data are made available via an Ethernet connection to a central data collection client computer provided by the customer for possible synchronization with other vehicle/sensor data inputs. The system also provides configurable escalating real-time alerts (haptic, audible, visual) meant to train and alert the backup-driver to maintain appropriate attention to the road scene and (back-up) driving task, whether the automated driving system is turned on or off.

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KEY FEATURES:

- Built to be retrofit into current automated driving test vehicles/fleets
- Operates in real world lighting and environmental conditions
- Operates with most common wearable items such as glasses, sunglasses, sickness face masks, caps, cosmetic make-up and jewellery
- Detects and reports driver attention state in real-time (e.g. on or off road)
- Detects and reports driver distraction events when the vehicle is moving and driver's face and eyes are off road, or closed, for extended periods
- Configurable escalating haptic, audible and visible alerts warn as necessary, and train the driver continuously, without being unduly intrusive
- System monitors vehicle speed and adjusts attention and distraction alerts accordingly (eliminating unnecessary alerts)
- Performs independently of driver appearance, facial expression or natural behaviours
- Tracks the face and eyes to very wide angular range and recovers tracking immediately when face or eyes become visible (e.g. due to temporary occlusions or not within camera field of view)
- Distraction event video and underlying data can be recorded in encrypted form on 32GB on-board flash memory and can be downloaded by authorized users by connecting to the USB interface from a PC
- System is configurable for specific camera location, vehicle geometry, and user requirements
- Integration to existing user back-end data collection server/cloud (via ethernet) is also possible with provided SDK API which exposes all real-time event/alert data, video, and system diagnostic/health information
- 1Mbps CAN message output option (via USB3 to CAN adaptor) with Driver Attention State, Driver Distraction Event, Alert and system health information
- System is Eye Safe per IEC-62471



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