



Technology

Pedestrian Protection



Mobileye's pedestrian protection application uses inputs from a single camera to detect and track pedestrians and to identify the danger of potential collisions. The system detects and tracks stationary or moving pedestrians in the vehicle's path as well as those entering the vehicle's path. The system measures target range, angular position, lateral velocity, and calculates the host vehicle's path. The software then determines whether the pedestrian is in a collision path with the vehicle and can issue warnings to the driver accordingly. Mobileye's pedestrian protection software functions reliably in cluttered urban settings, and is capable of detecting pedestrians in challenging real-life conditions, such as running pedestrians, and when contours are distorted e.g., carrying shopping bags, pushing a carriage or a trolley with goods. In cases with groups of people, including cases where pedestrians are occluded by others, the system issues a "crowd warning" signal, allowing additional cautionary measures.

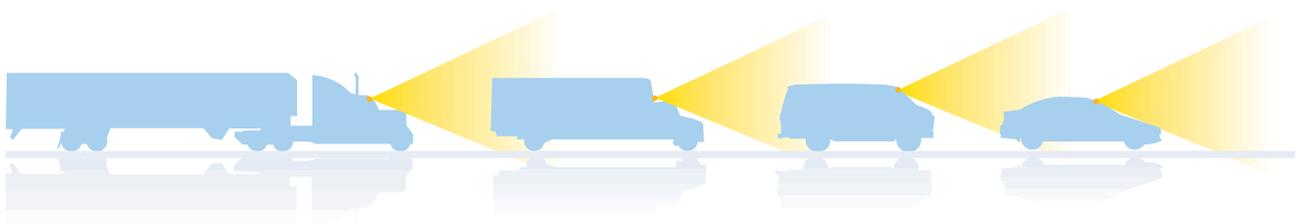
The pedestrian protection feature can be used as part of a warning system for drivers in pre-crash applications where certain measures may be taken to avert the collision or to decrease the impact for Adaptive Cruise Control (ACC) and, Stop and Go (urban ACC), and for autonomous passenger transporters traveling on roads or tracks. The image processing software also detects pedestrian crosswalks and can issue a signal to be used for speed warnings for the driver. The application uses a combination of optical flow analysis together

Features:

- Detects moving and stationary pedestrians
- Monocular image processor determines range to pedestrians, angular position and crossing speed
- Highlights pedestrians in collision-path and provides time to contact Copes with real-life conditions, e.g. walking, running, carrying parcels, pushing carriages
- Operates in cluttered urban environments
- "Crowd" detection signal
- Supports various image sensor types: Visible spectrum, Far-Infra-red (Night vision) and Near Infra-red
- Detects pedestrian crosswalks and issues a signal for speed warnings

with pattern recognition techniques suited for coping with a wide variety of postures and motions. In complex cases such as pedestrians

crossing in opposite directions and occluding each other, the system tracks the individual targets continuously through the time of occlusion maintaining a correct path prediction. The vision system compensates for turns by the host vehicle in order to predict pedestrians' paths correctly. For enhanced performance and to reduce false detections, the system also relies on vehicle detection capabilities, the ability to identify road vs. non-road regions, and pedestrian crosswalks.





Processing platform

The pedestrian protection application runs at 15-20 FPS on Mobileye's automotive qualified EyeQ™ ASIC vision system on a chip. Mobileye EyeQ™ has integrated a dual channel CAN controller and a glueless interface to various CMOS image sensors. A complete automotive vision system can consist of a single high-dynamic range CMOS image sensor and a compact electronic board including the Mobileye EyeQ™ processor, program memory and communication interface to the car's network. Mobileye's pedestrian protection application can be integrated with vehicle data, such as vehicle speed to obtain maximum performance and for improved estimated time to contact. The application performs in day and night and under a variety of weather conditions. In cases of poor visibility conditions, such as heavy rain or dense fog, the system notifies the driver.

Sensor types

The pedestrian protection application is suitable both for standard cameras (CMOS or CCD) as well as NIR and FIR cameras. The Mobileye application software also includes capabilities for advanced multi-slope gain control for high-dynamic range CMOS image sensors.

Application Options

The system can be enhanced to support the following add-on applications:

- Fusion with Radar and Lidar sensors
- Stop and Go
- Pre-crash active safety and collision mitigation
- Lane departure warning and lane keeping

Benefits:

- Reduces the driver's load and increases pedestrian safety
- Low-cost – suitable for mass implementation
- Compact size, single board solution
- High reliability and availability

Detection of crosswalk and pedestrians carrying shopping bags and pushing a trolley.



Crowd detection: presence of a crowd identified.



Continuous tracking of pedestrians even when temporarily occluded by pedestrians walking in opposite directions. Crossing pedestrians marked in red and static in white.



Pedestrians detected in wet road and glare conditions.



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