Advanced Vision Sensors

Enhanced Driver Vision
With a clear view and improved situation awareness in difficult driving conditions

Multi-Functional Vision & Ranging
Enabling unmatched performance in night, day and inclement weather

Enhanced Computer Vision
Improves the performance of autonomous functionality, responding to threats earlier
Automotive manufacturers, in an endless quest to improve vehicle safety and design autonomous vehicles, can now benefit from an image sensor that can see, determine distances, and identify obstacles, in daylight, night time and harsh weather conditions. When used in conjunction with existing technologies, this sensor adds all weather, 24/7 enhanced vision capabilities.

BrightWay Vision (BWV) is the leader in advanced gated-imaging sensors. BWV active gated technology operates like an optical radar for detection and ranging of obstacles, pedestrians, and traffic signs. It collects both images and range point clouds to be used for Advanced Driver Assistance Systems (ADAS) and Highly Automated Driving (HAD).

Active gated-imaging is a Time-Of-Flight (TOF) imaging technology, consisting a gated CMOS image sensor with tightly controlled opening and closing times of the sensor’s pixelated gate array. The gated sensor is used in conjunction with a Near Infrared pulsed-illumination source.

Image quality is enhanced through limiting the exposure time of the camera to the return time of an emitted light pulse from an object at a predefined distance. In other words, the Near Infrared illumination source, is pulsed at preselected intervals synchronized to a gated sensor.

The principle of active gated-imaging is used to enhance image contrast in scenes where the object of interest is obscured by clutter, such as rain, fog, snow and mist or by strong light sources, such as oncoming headlights and sun reflections that are blurring or saturating the sensor.

Exposing the sensor repeatedly in preselected intervals at a high frequency (thousands of times per second), allows the image to be collected from varying distances, known as “Slices”, with uniform intensity and contrast over the entire range. Each of these slices can be separately analyzed, using ADAS logic to identify pedestrians, animals, obstacles, retro-reflective traffic signs, lane marking and more.
**One Technology - Multiple Functions**

BWV introduces Enhanced Driver Vision (EDV) and is an enabler for Enhanced Computer Vision (ECV) in inclement weather and poor light conditions which supports robust & simplified ADAS and autonomous computation for all driving conditions.

**ADAS, AEB & Autonomous Vehicles**

**EDV / ECV – NIGHT VISION**

BWV provides superb automotive night vision capabilities to circumvent challenges of existing camera technologies, such as oncoming car headlights, unlit and almost invisible objects, and quickly changing light conditions. BWV image increases a driver’s perception and seeing distance in darkness, beyond the reach of the vehicle’s headlights. BWV image is immune to glare from similar systems, from oncoming headlights and from street lights.

**ECV- TSR**

Traffic Sign Recognition (TSR) identifies traffic signs such as ‘speed limit’, ‘school zone’ or ‘turn ahead’. The system can also detect overtaking restrictions. Recognition is based on BWV capability to analyze retro-reflective surfaces and by this to reduce computing power.

**EDV / ECV – HARSH WEATHER**

Using gated-imaging technology the system can operate in all light conditions, during the day or night (beyond vehicle headlamp illumination), and in all weather conditions, such as rain, snow, fog and mist. BWV technology overcomes backscatter due to rain, fog or snow which impacts the ability of standard vision systems to identify objects of importance.

**ECV- LDW / LKA**

Lane Departure Warning (LDW) is designed to warn the driver when the vehicle begins to steer off its lane, unless a turn signal is on in that direction. Lane Keeping Assist (LKA), in addition to LDW, automatically take steps to ensure the vehicle stays in its lane. BWV provides a clear image in adverse weather, with tire spray and in shadow conditions to enable a robust lane marking detection.

**ECV – OBJECT DETECTION / AEB PEDESTRIANS**

Pedestrian and animal accidents are the one of the highest cause of traffic injuries and fatalities. Pedestrian detection, has become an integral part of ADAS functionality and AEB protocols. In order to avoid collisions with pedestrians and other types of objects, they must be detected. BWV sensors, using the slicing and ranging capabilities detects any object in vehicle path. This ability is enabled in day, night (e.g. to be used in conjunction with object spot highlighting function) and adverse weather conditions.

**ECV – IHC**

IHC (Intelligent Headlight Control) continuously tailors the headlamp range so the beam just reaches other vehicles ahead, ensuring maximum possible seeing range without blinding other road users. BWV, with its immunity to oncoming vehicle glare, can clearly identify oncoming cars and their distance, to ensure a proper IHC implementation.

**ECV – FREE PATH**

Much like LIDAR, but using BWV active gated-imaging, the system can accurately collect a dense point cloud (range map information) and measure the distance between the vehicle and a possible obstacle in the distance. BWV ranging capability can then be used for free path and any other range based application such as object detection, FCW etc.

**ECV- FCW / AEB CITY & INTER-URBAN**

Forward Collision Warning (FCW) and AEB protocols are designed to prevent rear-end collisions. BWV technology increases the positive detection and reduces false detection of vehicles (e.g. passenger cars, uses, trucks etc.) by providing enhanced vision of the forward facing camera.
In order to help OEMs, Tier1 suppliers select and implement BWV’s active gated technology, BWV has developed BrightEye™. BrightEye module kit enables the user to experience and demonstrate the benefits of BWV technology as to ADAS functions and autonomous driving. BrightEye provides vision and ranging capabilities for ADAS & HAD features in all driving and weather conditions such as: night, day and harsh weather (rain, snow, mist and fog).

**BrightEye provides:**
- Natural and intuitive contrast images
- Superb performance in harsh weather such as rain, snow, mist and fog
- Homogenous imagery throughout the entire range
- Outstanding obstacle detection and forward collision warning based on active-gated technology
- Exceptional distance from obstacle measurement
- The ability to enhance certain volumes of the scenery (Slices)
- 3D range information (LIDAR like point clouds)

**BrightEye A-Sample consists of:**
- Camera Unit: System control and the gated camera image sensor
- Light Source Unit: A pulsed Near-Infrared diffusive illumination laser
- Control Box
- Cable set

In addition to the hardware components, BWV also provides the operating code and the general knowhow required to integrate this hardware into a specific car, or generic kit. Our team of engineers will support you during the analysis phase and the implementation phase of the sensors (GCMOS or AGCMOS) the Laser Module (LM) and the operating code.

**BWV provides a subset of enhanced vision & ranging ADAS/HAD features for testing purposes and for preliminary implementations**

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