AUTONOMICS

FUSION

Multispectral computer vision system
for service robots.

Q4 2021

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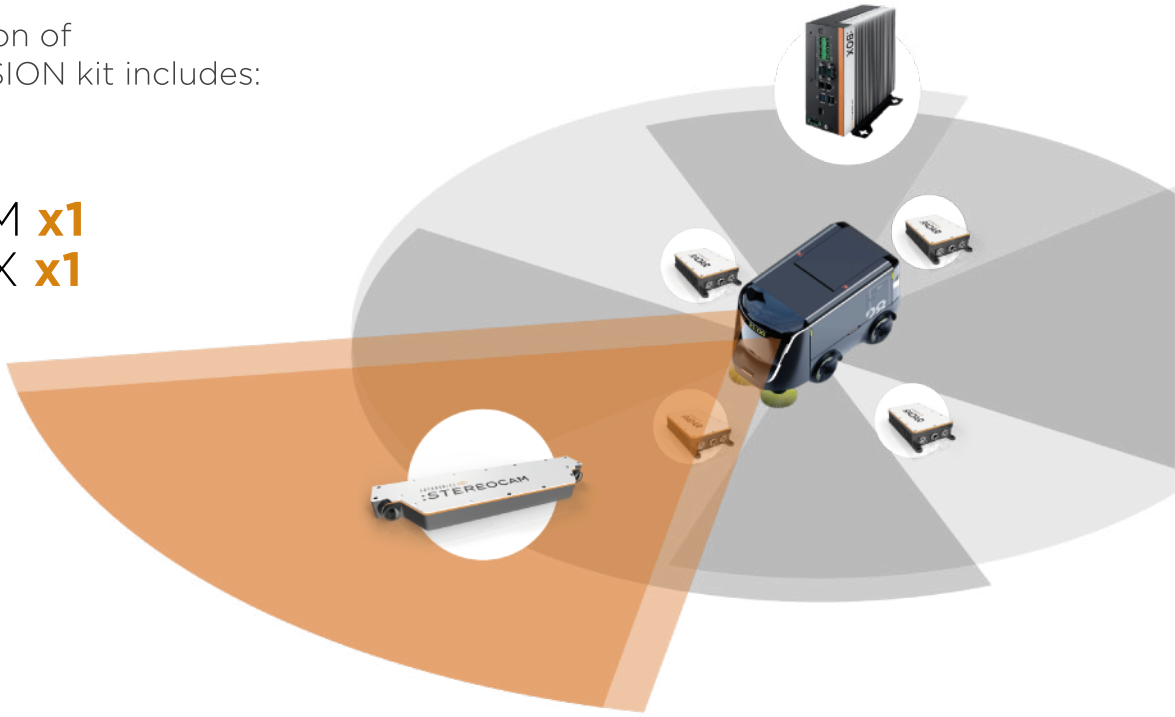
AUTONOMICS FUSION is the
integrated modular multispectral computer vision system
for service robots, based on the data fusion of smart sensors:
- mmWave 4D imaging radar AUTONOMICS RADAR;
- stereo camera with embedded dense disparity processing and object detection AUTONOMICS STEREOCAM.

Typical configuration of
AUTONOMICS FUSION kit includes:

RADAR **x4**
STEREOCAM **x1**
FUSION BOX **x1**



Features

1: AUTONOMICS BOX provides sensor **data fusion**, complex high-level computer vision task solutions, and issues the following information about the surrounding environment to external systems:

raw data level:
- video from AUTONOMICS STEREOCAM sensors;

data feature level:
- depth maps from AUTONOMICS STEREOCAM;
- point clouds from AUTONOMICS RADAR;
- visual odometry data (optional, on request);

semantic information level:
- detected objects: pedestrians, vehicles, traffic lights (2D bounding box, distance, motion parameters,class);
- video semantic segmentation (optional, on request);
- occupancy grid (optional, on request);
- SLAM results (optional, on request).

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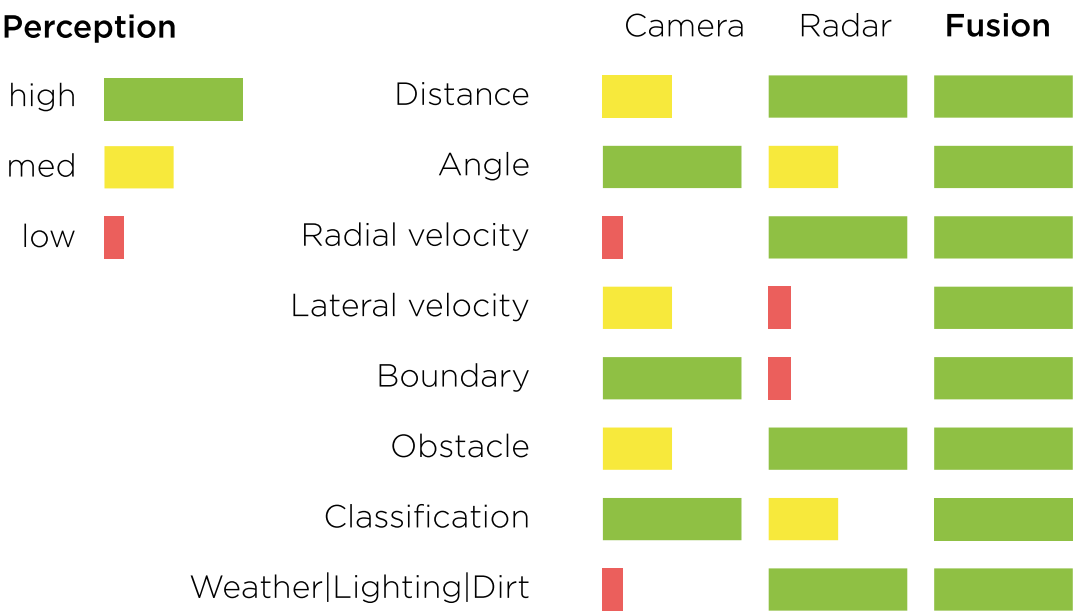
Features

2: AUTONOMICS STEREOCAM and AUTONOMICS RADAR **data fusion** provides unprecedented level of

safety, situational awareness and cost efficiency

of service robots, operating in environments shared with people, even in harsh conditions.



The fully functional technical vision solution, operating in any conditions not requiring expensive LIDAR sensors.

3: **Modular design and software-defined features**

of AUTONOMICS FUSION provide flexibility and adaptability of our solution to any required applications.

4: **ROS compatibility**

makes it easy to integrate AUTONOMICS FUSION into existing systems.

ROS

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STEREOCAM Specifications

Sensor	**Sony Pregius IMX 265, Color**
Sensor resolution	**1920 x 1080 pixels**
Shutter control	**Global shutter**
Field of view: horizontal / vertical	**60° / 32°**
Stereo baseline distance	**342 mm**

Embedded stereo processing

Embedded Stereo disparity pipeline	**FPGA-based: Census, multi-window aggregation, Semi-global Matching with 4 paths and two passes**
Embedded Postprocessing	**Uniqueness check, WTA with subpixel accuracy (1/16), Consistency check**
Erroneous pixels in non-occluded areas (with 3 pixels error threshold), %	**3.5**
Average disparity error in non-occluded areas, pixels	**0.8**
Density: percentage of pixels for which ground truth has been provided by the method, %	**93**
Stereo processing max performance	**2 GDisp/sec**

Disparity map resolution, pixels	800x400	800x400	1200x600	1200x600
Disparity range	128	256	128	256
Frame rate, FPS	30	15	20	10

Object detection/recognition

Recognition objects	**Vehicle, Pedestrian, Traffic Light (with signal recognition)**
Output data	**2D bounding box, class, confidence**
Frame rate, FPS	**10**

STEREOCAM Specifications

Hardware details	
Operating Voltage	**9 – 36 V DC**
Power Consumption	**< 40 W**
Dimensions	**392x100x32 mm**
Weight	**2 kg**
Interfaces	**Gigabit Ethernet, CAN**
Shock load	**75g / 5 ms**
Vibration load	**5g / 5 Hz – 500 Hz**
Ambient operating temperature	**-50 °C ... +50 °C**

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RADAR Specifications

Software-defined* Mode	Short-range	Long-range
Operating Frequency	77 – 81 GHz	
Detection Range	0.2 m – 50 m	0.4 m – 150 m
Max Velocity	±10 m/s	
Azimuth Field of View	140°	90°
Elevation Field of View	30°	
Range Resolution	<0.1 m	<0.3 m
Range Accuracy	0.05 m	0.15 m
Velocity Resolution	<0.15 m/s	
Velocity Accuracy	0.075 m/s	
Azimuth Resolution	< 1.5° (at <50° from bore sight)	
Azimuth Accuracy	0.25°	
Elevation Resolution	20°	
Elevation Accuracy	10 Hz	
Update Rate, FPS	9 – 36 V	
Operating Voltage	<15 W	
Power Consumption	203×110×45	
Dimensions (WxHxD mm)	CAN, Ethernet	
Interface (Data Output Interface)	IP67	
Dust and moisture resistance (IP Rating Target)		

*It is possible to adjust the characteristics of AUTONOMICS RADAR software to the specific parameters of detection range and resolution

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BOX Specifications

Processor System **Jetson AGX Xavier**	
GPU	**NVIDIA Volta™ architecture with 512 NVIDIA CUDA cores and 64 Tensor cores 11 TFLOPS (FP16) 22 TOPS (INT8)**
CPU	**8-core ARM v8.2 64-bit CPU, 8MB L2 + 4MB L3**
DLA	**5 TFLOPS (FP16) 10 TOPS (INT8)**
Memory	**16/32 GB 256-bit LPDDR4x 2133MHz - 137GB/s**
Storage	**32GB eMMC 5.1**
Ethernet	
Interface	**RJ45 x 2**
Controller	**LAN1: Intel i210 LAN2: Marvell 88E1512**
Speed	**10/100/1000 Mbps**
USB	**Internal: 1 x USB2.0 External: 2 x USB2.0, 2 x USB3.0**
Display	**HDMI (Max. resolution 3840x2160 @ 60Hz)**
Storage	**2.5" HDD/SSD (Max. 9.5mm) x 1 (Internal) 1 x M.2 (NVMe 2280)**
Power supply Voltage	**9-36V**
Environment	
Operational Temperature	**-10+55°C**
Vibration	**0.5Grms @ 5 ~ 500 Hz, random, 1 hr/axis**
Mechanical	
Dimensions (W x D x H)	**192 x 230 x 87 (mm)**
Weight	**4.5 kg**