VI-SENSOR

VISUAL-INERTIAL SENSOR

The VI-Sensor is a high quality visual-inertial sensor platform providing hardware-synchronized 6-DoF inertial data combined with stereo images. The VI-Sensor's code examples, ROS bridge and accurate factory calibration ensures fast and easy integration in your applications.

STEREO CAMERA

» 11 cm baseline

» 2x low-light sensitive Aptina CMOS chip

» Global shutter @ 30 Hz, 752x480

INERTIAL MEASUREMENT UNIT

» Analog Devices ADIS16448

» 6 DoF inertial data @ 200 Hz
(triaxial gyroscopes and accelerometers)

» Pressure sensor

FACTORY CALIBRATED

» Spatial and temporal inter-sensor calibration

» Camera: Intrinsics and extrinsics

» IMU: Sensitivity, axis misalignment, bias

SYNCHRONIZATION & TIMESTAMPING

» Hardware timestamping of sensor data

» Exposure time centered timestamping

» Trigger output to synchronize external sensors

LIGHTWEIGHT & SMALL

» 130 g / 133 x 40 x 57 mm

READY TO USE

» Code examples for Linux

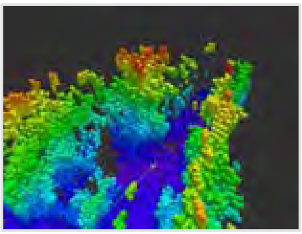
» ROS & OpenCV compatible

» Ready for visual-odometry framework VISO2

REFERENCE PROJECTS

UAV NAVIGATION

The VI-Sensor has been successfully integrated on small UAVs for onboard, real-time pose estimation. A new state estimation framework using only synchronized & timestamped sensor outputs provides real-time information on relative orientation and translation, which is fundamental for reliable UAV navigation.



DENSE STEREO RECONSTRUCTION & MAPPING

The synchronized stereo images of the VI-Sensor have been used for dense real-time stereo reconstruction and mapping. Future embedded image processing on the VI-Sensor FPGA will further reduce host CPU load and integration effort by the user. The resulting 3D maps can be used for obstacle avoidance in numerous navigation scenarios.

AERIAL INSPECTION

Industrial environments are often unstructured and complex to navigate in. Furthermore GPS is not available when flying near buildings or even indoors for inspection. With the VI-Sensor, state estimation and dense stereo reconstruction, navigation in unstructured indoor environments becomes feasible.

APPLICATION SCENARIOS

» Robotics

» Navigation and mapping

» Photogrammetric survey

» Augmented reality applications

» Automation

ROS Enabled

Additional information:
www.skybotix.com

Skybotix

Autonomous Systems Lab

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Swiss Federal Institute of Technology Zurich

VI-SENSOR

FACTSHEET

Available Data	Description	Value	
Stereo camera			
Synchr. stereo images	752 x 480, 8 Bit monochrome	30[1]	Hz
External camera modules[2]	optional		
Synchronized images	752 x 480, 8 Bit monochrome	20[1]	Hz
Inertial measurements			
3-Axis accelerations	± 18g	200	Hz
3-Axis angular velocities	± 1000°/s	200	Hz
Pressure	300 to 1200 mBar	100	Hz

Camera

Camera chip	Aptina MT9V034		
Shutter	global shutter		
Stereo baseline		110	mm
Lens[3]			
Type	Lensagon BM2820		
Focal length		2.8	mm
Field of view	diagonal, horizontal, vertical	122, 98, 73	deg
Number of cameras		2 (4)[2]	

Inertial Measurement Unit

Model[4]	Analog Devices ADIS 16448

Factory Calibration

Inertial measurement unit	axis misalignment, sensitivity, bias, temperature compensation
Stereo camera	distortion, spatial inter-camera
Camera - IMU inter-sensor	spatial and temporal

Communication

Gigabit ethernet			
Auxilary trigger output		3.3	V

Electrical

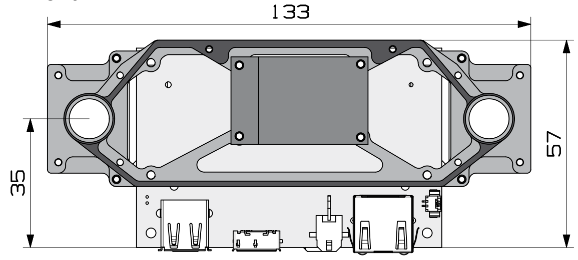
Operating voltage	overvoltage and polarity protection	10 to 13	V
Powering options	12V main supply USB 3	12 5	V V
Power consumption		< 10	W

Physical

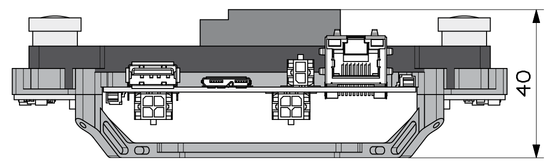
Lens mount	S-Mount 12mm		
Weight		130	g
Dimensions		133 x 40 x 57	mm

[1] 4-camera configuration framerate 20 hz for all cameras
[2] up to 2 additional camera modules available upon request
[3] other models available upon request
[4] standard version with industrial-grade ADIS 16448 available

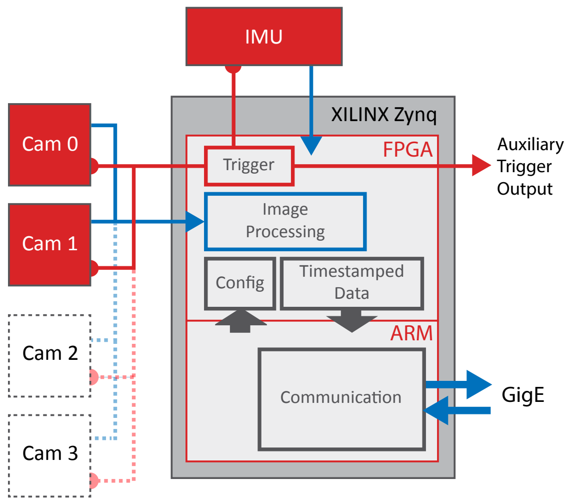
Front



Bottom



Components



Linux Code Examples

To interface the VI-Sensor by software, an Ubuntu Linux C++ library package is provided. It allows the user to register custom callback functions, such that the sensor data can be accessed as shared pointer with zero data copy.

Easy ROS integration

Besides the standard linux libraries, the system is fully ROS conform and provides standard ROS IMU- and camera messages. Additional information such as shutter time and image gain are provided as custom ROS messages. Furthermore, sensor parameters are adjustable during runtime using the open-source driver or ROS dynamic reconfigure. Sample projects demonstrate the integration of the VI-Sensor in OpenCV as well as ROS.

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