MULTISENSE STEREO

COMPACT & ACCURATE 3D DATA COLLECTION

MultiSense S21

MultiSense S7S

MultiSense S7

MultiSense 3D Cameras

Using less than 10 Watts, the MultiSense 3D cameras produce full-frame range images at up to 30 Hz with approximately 1 frame of latency.

Carnegie Robotics®

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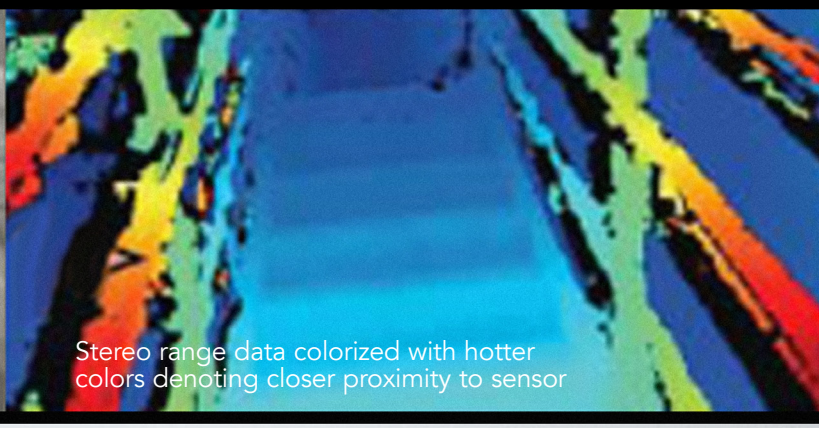
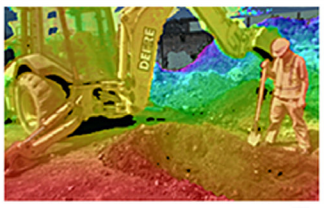


Stereo range data colorized with hotter colors denoting closer proximity to sensor

KEY FEATURES

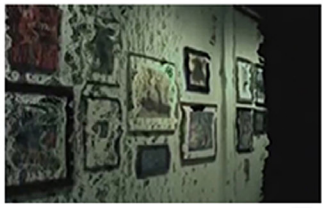
RUGGED DESIGN

Our cameras are designed and tested for harsh environments. Carnegie Robotics subjects each sensor to a battery of vibration and thermal tests as part of its quality process.



DENSE, LOW LATENCY STEREO IMAGERY

MultiSense can find over 11 million feature matches every second. If desired, the stereo point cloud can be augmented by overlaying color image data onto the point cloud—resulting in compelling, very low latency, life-like 3D data sets.



EASY DATA OPTIONS

3D point clouds from the stereo camera can be colorized onboard the sensor. The sensor provides extremely dense "full frame" range data at user-configurable frame-rates and also outputs standard color video.

MORE POINTS, LESS HASSLES

Our easy to use ROS-based API and tools allow you to view live image and 3D range data; adjust camera and stereo parameters; log data; playback logs; check the unit's calibration; and change the sensor's IP address. An open-source C++ library and Gigabit Ethernet interface make it easy to integrate live data into your robot, vehicle, mobile equipment, lab environment, or other application.

MultiSense S7

MultiSense S21

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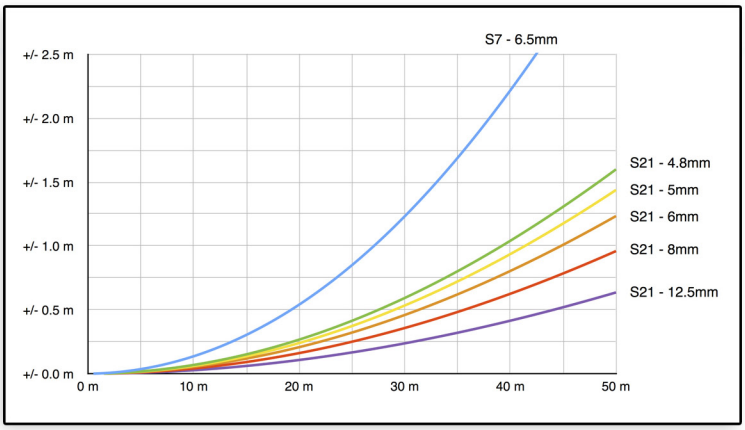
Mechanical/Environmental	S7	S7S	S21	Note
Operating Temperature	-10 to 50 C			
Environmental Rating	IP68			
Height	6.5 cm	6.5 cm	6.3 cm	
Width	13 cm	13 cm	27.4 cm	
Depth	13 cm	11 cm	13.0 cm	
Weight	1.2 kg	1.1 kg	1.5 kg	
Electrical				
Voltage (nominal)	24-48 V		12-48 V	
Voltage (maximum)	24-48 V		10-48 V	S21 requires 10 V to power on, voltage can then drop to 6 V.
Power (nominal)	7 W			
Power (full lighting)	7 W; 19 W	n/a	n/a	7 W with lights strobing, 19 W with no strobing.
External Connector	Glenair Mighty Mouse, 801-009-07MT9-19PA			S7 also includes 2x 801-009-07MT6-4SA connector for external lighting power and control.
Image Sensors				
Model	CMOSIS CMV2000 or CMV4000			Monochrome or IR sensor options also available.
Resolution	2048 x 1088 or 2048 x 2048			
Active Area	11.2 x 6 mm or 11.2 x 11.2 mm			Larger image area corresponds to CMV4000 imager.
Frame Rate	30 FPS max			
Sensitivity	5.56 V/lux-s			For monochrome imagers, Bayer filter on color imagers reduces sensitivity.
Color Filter Array	Bayer			
Lenses				
Focal Length	6.5 mm		4.8-12.5 mm	
Field of View	80° x 49° (2MP sensor); 80° x 80° (4MP sensor)		Varies with lens	
Aperture	Fixed at factory			Possible values: f1.4 to f16.
Focus	Fixed at factory			
Illumination				
Number LED Illuminators	2	0	0	S7 has support for additional 2x external LEDs.
Color Temperature	4100K	n/a	n/a	
Brightness	690 lm each	n/a	n/a	
Power	6 W per LED	n/a	n/a	S7 light power is at 100% duty, no strobing. Strobing is user-adjustable.
Field of View	1 @ 18°, 1 @ 44°	n/a	n/a	
Synchronization	Cont or Sync	n/a	n/a	Continuous illumination or synchronized to camera exposure.
Stereo Vision				
Algorithm	SGM			
Maximum Disparities	256			
Sub-pixel Resolution	1/16th pixel			
Peak Throughput	2 GPxD/s (Giga-Pixel-Disparities/second)			
Performance @ 2048 x 1088	7.5 FPS with up to 128 disparities			
Performance @ 2048 x 544	15 FPS with up to 128 disparities			
Performance @ 1024 x 544	30 FPS with up to 128 disparities			
Minimum Range	0.4 m	0.4 m	1.5 m	With 2048 pixel horizontal resolution, 256 disparities.
Triggering/Synchronization				
External Opto- isolated Input	1x	1x	2x	
External Opto-isolated Output	1x	1x	2x	
Time-base	Internal timebase with sub-microsecond resolution			Used to timestamp all outgoing data (including disparity maps and captured images).
Time Synchronization	External pulse input (e.g. Pulse-Per-Second) Time system with host			PPS mutually exclusive with external trigger (due to limit of 1 external input). PPS signal sets sub-second time, while network message sets absolute time.
Camera Trigger Sources	Internal free-running; Network message; External trigger input			
Opto-isolated Output Sources	Synchronized to camera exposure; Pulse-per-second			Allows external cameras and illumination devices to be synchronized with internal camera exposure. Alternatively, external devices may be synchronized such that their exposures never overlap with internal camera exposure (for example, in order to support a structured illumination device that is only visible to some of the cameras).
Interface				
Network Interface	1 Gigabit Ethernet port (1000BASE-T)			Full-duplex only. Can auto-negotiate down to 10/100 speeds at significant impact to sustained camera framerate.
Throughput	Up to 120 MB/s			Achievable throughput depends on quality of host side Ethernet adapter/drivers.
Jumbo Frames	Up to 9000 bytes			Full frame rates may not be achievable without use of jumbo-frames.
Low-level Protocol	UDP/IP; IPv4 only			
IP Address Assignment	Static			
Device Discovery	Direct connect to known IP			
Application Interface (C++)	High-performance C++ API with support for blocking, polled and asynchronous (callback based) methods.			
Application Interface (ROS)	ROS-based API and tool set			View live image and 3D range data, adjust camera and stereo parameters, log and playback data, check calibration, and change IP address.
Image Formats	Grayscale, RGB, YCbCr; Packed, Planar; Various bit depths			Formats may be selected to optimize use of available network bandwidth. API can provide efficient automatic conversion to standard byte-aligned formats on host side.
Image Streams	Unrectified (left/right), Rectified (left/right), and Depth			



Estimated stereo accuracy as a function of lens type and range

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