OAK-D-LR

Overview

The OAK-D LR (Long Range) was designed to provide an accurate long range stereo depth perception. It allows users to easily change the M12 lenses for the cameras, which also affects the max length of stereo depth perception.

It has three AR0234 global shutter colour cameras, that act as a multi-stereo pairs to achieve accurate, long range and short range depth perception.

The OAK-D LR leverages our OAK-SoM-Pro to make a overall compact design. The use of the SoM reduces the design's scale, making it easier to mount or fit in various robotic processes. The design is also open-source, allowing for any necessary modifications.

Hardware Specification

For communication and power, the OAK-D LR camera uses either:

USB-C cable - it supports both USB2 and USB3 (5Gbps / 10Gbps).

Power-over-Ethernet (PoE) - it offers full 802.3af and Class 3 PoE compliance with 1000BASE-T speeds (1 Gbps). A PoE injector/switch is required to power the device.

Camera Specification:

Camera Specs	Colour Camera	Stereo Pair
Sensor	IMX378 (PY060)	OV9282 (PY059)
Shutter	Rolling	Global
DFOV/HFOV/VFOV	120°/95°/70°	150°/128°/80°
Resolution	12MP (4056x3040)	1MP (1280x800)
Focus	FF: 60cm - ∞	FF: 18cm - ∞
Max Framerate	60 FPS	120 FPS
Pixel Size	1.55µm x 1.55µm	3.0µm x 3.0µm

Depth accuracy

The OAK-D LR is designed to provide accurate depth perception at long range. The depth accuracy is dependent on number of factors (docs here), but also FOV and baseline distance between stereo cameras.

HFOV [°]	< 3% depth error	< 5% depth error	< 10% depth error	MinZ
10	54.9 m	137.2 m	274.3 m	3.85 m
20	27.2 m	68.1 m	136.1 m	1.91 m
30	17.9 m	44.8 m	89.6 m	1.26 m
40	13.2 m	33.0 m	65.9 m	0.93 m
50	10.3 m	25.7 m	51.5 m	0.72 m
60	8.3 m	20.8 m	41.6 m	0.58 m
70	6.9 m	17.1 m	34.3 m	0.48 m
80	5.7 m	14.3 m	28.6 m	0.41 m
82	**5.5 m**	**13.8 m**	**27.6 m**	**0.39 m**
90	4.8 m	12.0 m	24.0 m	3.85 m
100	4.0 m	10.1 m	20.1 m	0.28 m

Note: we haven't tested these combinations, we only calculated theoretical depth error and interpolated those values with our previous real-world tests when enabling subpixel disparity:

- < 3% error - 20th disparity pixel, which has 5% full-pixel error (~3% with subpixel enabled)
- < 5% error - 8th disparity pixel, which has 12.5% full-pixel error (~5% with subpixel enabled)
- < 10% error - 4th disparity pixel, which has 25% full-pixel error (~10% with subpixel enabled)

Maximum depth was calculated by using the large (15cm) baseline, while MinZ was calculated by using the small (5cm) baseline of the OAK-D-LR. You can further decrease MinZ by using Extended Disparity Mode, lower resolution, or using disparity shift (docs here).

RVC2 inside

This OAK device is built on top of the RVC2. Main features:

- **4 TOPS** of processing power (1.4 TOPS for AI - RVC2 NN Performance)
- **Run any AI model,** even custom-architectured/built ones (models need to be converted)
- **Encoding** H.264, H.265, MJPEG - 4K/30FPS, 1080P/60FPS
- **Computer Vision** warp/dewarp, resize, crop ia ImageManip node, edge detection, feature tracking. You can also run custom CV functions
- **Object Tracking** 2D and 3D tracking with ObjectTracker node
- **Stereo Depth** perception with filtering, post-processing, RGB-depth alignment and high configurability

Dimensions and Weight

- Width: 202 mm
- Height: 44 mm
- Length: 40 mm
- Weight: 415g

3D Models

- Board (PCBA) STEP files here
- Enclosure STEP files here

Files

- Altium project files
- Assembly Drawing
- Assembly Outputs
- Fabrication Drawing
- Fabrication Outputs
- Schematic