

1. ROS camera driver

1.1. What is ROS?

The Robot Operating System (ROS) is a set of software libraries and tools that help you build robot applications. From drivers to state-of-the-art algorithms and with powerful developer tools, ROS has what is needed for a robotics project. It is all open source (Source: ROS.org). For more details, also refer to ROS.org and ROS Wiki sensors.

1.2. Building the ROS driver

Extract zip file for example in `~/projects/` directory

Change current directory:

```
> cd ~/projects/cam660_fpga_driver
```

Build a project from the command:

```
> catkin_make
```

Change to the home directory and open the bash-file:

```
> cd ~
```

```
> gedit .bashrc
```

Insert the following line at the end of the bash-file:

```
source ~/projects/cam660_fpga_driver/devel/setup.bash
```

Save the file and exit editor.

Log-out and again log-in linux or execute command:

```
> source ~/projects/cam660_fpga_driver/devel/setup.bash
```

1.3. Running the ROS driver with launch file

Start the ROS with GUI in terminal mode with the following command:

```
roslaunch espros_cam660_fpga camera.launch
```

The ROS tool opens with the different node windows and is ready to use.

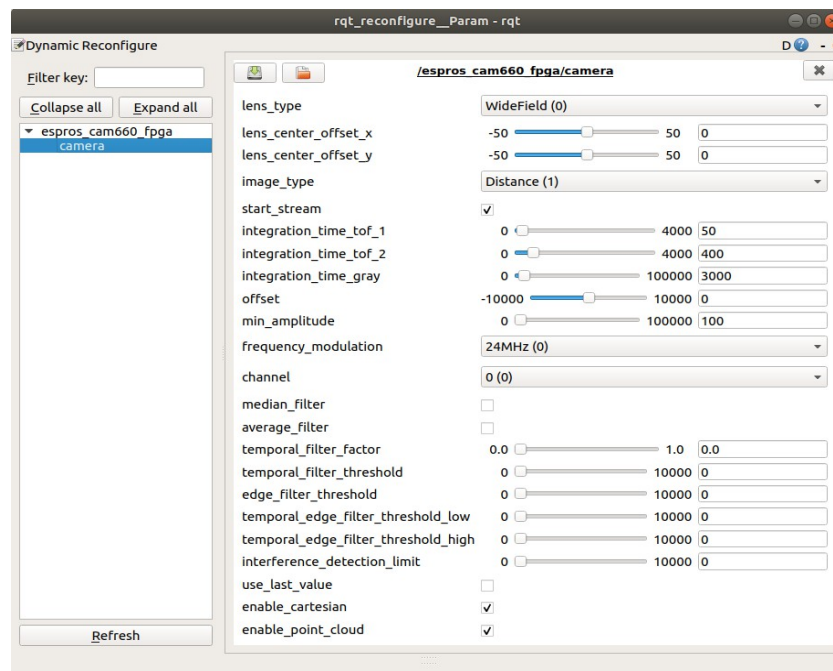


Figure 1: Example of the “dynamic reconfigure” node window

Start the camera operation by changing in the menu the parameter “start_stream” from false to true.

2. ROS API

This is the official driver for the camera ESPROS TOFcam660_fpga.

2.1. Start of the node

If you use in terminal mode the APIs only, without GUI:

Start the ROS operating system with the command: `roscore&`

Start the TOFcam660 with the command: `roslaunch espros_cam660_fpga cam660_fpga_node`

2.2. Published topics

Topic name	ROS msgs file	ROS message type	Function
camera/distance_image_raw	sensor_msgs	Image	Sends the grayscale or amplitude image according the selected image type parameter
camera/amplitude_image_raw	sensor_msgs	Image	Sends the distance image for image type parameters which include distance
camera/dcs_image_raw	sensor_msgs	Image	Sends 4 dcs images
camera/points	sensor_msgs	PointCloud2	Sends the point cloud image for image type parameters which include distance

Table 1: ESPROS ROS topics

2.3. Dynamically reconfigurable parameters

Refer for details on the dynamically reconfigurable parameters to the enclosed "dynamic_reconfigure package" or to http://wiki.ros.org/dynamic_reconfigure.

Parameter	Function	Data format	Default	Reference
~lens_type	Sets the lens field of view 0: WideField 1: StandardField 2: NarrowField	int	0	n/a
~lens_center_offset_x	Sets the offset of lens center relative to sensor center Range: -50 ... 50 pixels	int	0	n/a
~lens_center_offset_y		int	0	n/a
~image_type		int	1	n/a
~start_stream	Enables image streaming	bool	True	n/a
~integration_time_tof_1	Sets the integration time for distance measurements in microseconds. Range: 1 ... 4'000 µs	int	50	n/a
~integration_time_tof_2		int	400	
~integration_time_gray	Sets the integration time for grayscale measurements in microseconds. Range: 0 ... 50'000 µs	int	3000	n/a
~offset	Sets distance offset. Range: -10000 ... 10000 mm	int	0	n/a
~min_amplitude	Sets the amplitude limits. Range 0 ... 2'047 LSB	int	100	
~frequency_modulation	Sets camera frequency modulation. Range: 24 ... 0.75 MHz	int	0	n/a
~channel	Sets camera frequency modulation offset.	int	0	n/a
~median_filter	Enables the spatial median filter for distance filtering	bool	False	n/a
~average_filter	Enables the spatial average filter for distance filtering	bool	False	n/a
~temporal_filter_factor	Sets the factor 'k' of the temporal filter (Kalman). Range: 0.0 ... 1.0	double	0	n/a
~temporal_filter_threshold	Sets the threshold of the temporal filter (Kalman). Range: 0 ... 10000 mm			
~edge_filter_threshold	Spatial edge filter threshold. Range: 0 ... 10000 mm	int	0	n/a
~temporal_edge_filter_threshold_low	Temporal edge filter low threshold. Range: 0 ... 10000 mm	int	0	n/a
~temporal_edge_filter_threshold_high	Temporal edge filter high threshold. Range: 0 ... 10000 mm	int	0	n/a
~interference_detection_limit	Interference detection threshold. Range 0... 10000 mm	int	0	n/a
~use_last_value	Enables interference detection last value	bool	False	n/a
~enable_cartesian	Enables point cloud cartesian transformation (false = spheric)	bool	True	n/a
~enable_point_cloud	Activates pointCloud2Publisher node to send information (camera/points)	bool	True	Table1

Table 2: ROS parameter table