pcl_apps Documentation

Release 0.0.0

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Aug 09, 2023

Modules

pcl_apps is a ROS2 wrapper of the PCL. (Point Cloud Library)
All of the modules are made by ROS2 components.
developed by OUXT Polaris.

pcl_apps is availabe here .

CHAPTER 1

Filter Components

PCL wrapper components for filtering point clouds.

1.1 Points Transform

pcl_apps::PointsTransformComponent has these topic interface.

Input Topics	Type	Description
(param : ~/input_topic)	sensor_msgs::msg::PointCloud2	Input Point Cloud

Output Topics	Type	Description
~/output	sensor_msgs::msg::PointCloud2	Output Point Cloud

Parameter	Type	Description	Default
~/output_frame_id	String	Frame ID of the Output Point Cloud	“”
~/input_topic	String	input topic name	~/input

1.1.1 Description

pcl_apps::PointsTransformComponent subscribe PointCloud topic and transform it to the output_frame_id.

1.1.2 Requirements

1. frame_id of the input/output frame shoud be exist.

1.1.3 How to launch with single node

```
ros2 run pcl_apps points_transform_node
```

1.2 Points Concatenate

pcl_apps::PointsConcatenateComponent has these topic interface.

Input Topics	Type	Description
(param : ~/input_topic0)	sensor_msgs::msg::PointCloud2	Input Point Cloud0
(param : ~/input_topic1)	sensor_msgs::msg::PointCloud2	Input Point Cloud1
(param : ~/input_topic2)	sensor_msgs::msg::PointCloud2	Input Point Cloud2
(param : ~/input_topic3)	sensor_msgs::msg::PointCloud2	Input Point Cloud3

Output Topics	Type	Description
~/output	sensor_msgs::msg::PointCloud2	Output Point Cloud

Parameter	Type	Description	Default
~/num_input	Int	Number of Input Point Cloud Topics	2
~/input_topic0	String	input topic name	~/input0
~/input_topic1	String	input topic name	~/input1
~/input_topic2	String	input topic name	~/input2
~/input_topic3	String	input topic name	~/input3

1.2.1 Description

pcl_apps::PointsConcatenateComponent subscribes multiple pointcloud topics and concatenate them. pcl_apps::PointsConcatenateComponent use approximate time synchronizer in ROS2.

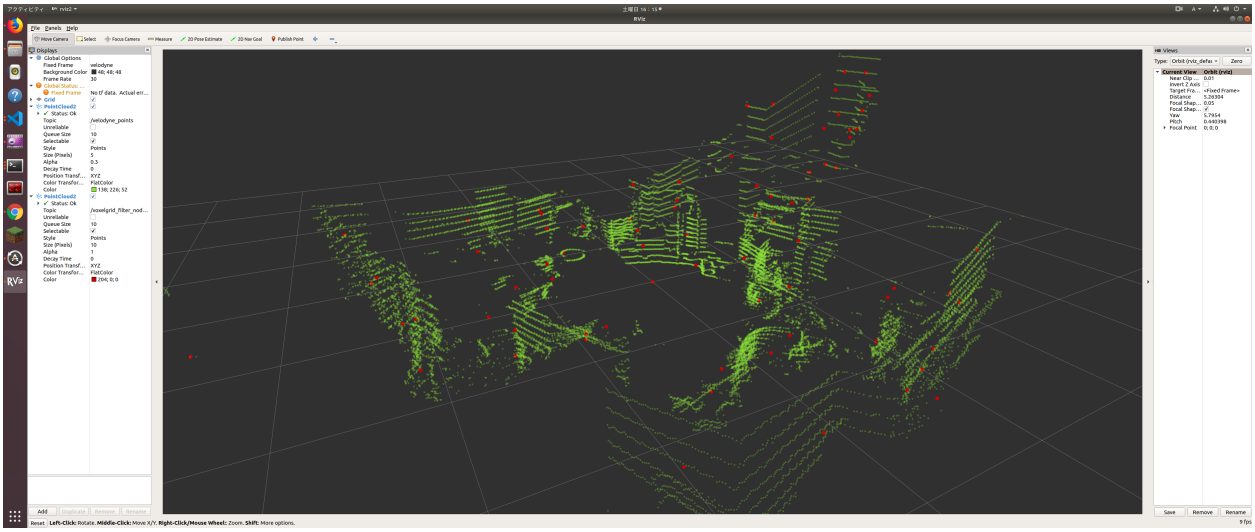
1.2.2 Requirements

1. all of input topic frame should be same.
2. all of the input topic should be published if you want to publish output pointcloud.

1.2.3 How to launch with single node

```
ros2 run  pcl_apps points_concatenate_node
```

1.3 VoexlGrid Filter



pcl_apps::VoexlGridFilterComponent has these topic interface.

Input Topics	Type	Description
(param : ~/input_topic)	sensor_msgs::msg::PointCloud2	Input Point Cloud

Output Topics	Type	Description
~/output	sensor_msgs::msg::PointCloud2	Output Point Cloud

Parameter	Type	Description	Default
~/leaf_size	Double	Leaf size of the Voexlgrid	1.0
~/input_topic	String	input topic name	~/input

1.3.1 Description

pcl_apps::VoexlGridFilterComponent subscribe PointCloud topic and publish downsampled pointcloud by using Voexlgrid Filter

1.3.2 Requirements

1. leaf_size should be over 0

1.3.3 How to launch with single node

```
ros2 run pcl_apps voxelgrid_filter_node
```

1.4 Radius Outlier Removal

pcl_apps::RadiusOutlierRemovalComponent has these topic interface.

Input Topics	Type	Description
(param : ~/input_topic)	sensor_msgs::msg::PointCloud2	Input Point Cloud

Output Topics	Type	Description
~/output	sensor_msgs::msg::PointCloud2	Output Point Cloud

Parameter	Type	Description	Default	Dynamic
~/search_radius	Double	Radius of the search sphere	1.0	True
~/min_neighbors_in_search_radius	Int	Min numbers of neighbors in search radius	1	True
~/input_topic	String	input topic name	~/input	False

1.4.1 Description

pcl_apps::RadiusOutlierRemovalComponent subscribe PointCloud topic and publish filterd topic

1.4.2 Requirements

1. min_neighbors_in_search_radius should be over 1
2. search_radius shoud be over 0

CHAPTER 2

Matching Components

Matching components matching multiple point clouds

2.1 NDT Matching

pcl_apps::NdtMatchingComponent has these topic interface.

Input Topics	Type	Description
(param : ~/input_cloud_topic)	sensor_msgs::msg::PointCloud2	Input point cloud
(param : ~/reference_cloud_topic)	sensor_msgs::msg::PointCloud2	Reference point cloud
(param : ~/initial_pose_topic)	geometry_msgs::msg::PoseStamped	Initial pose of the ndt matching

Output Topics	Type	Description
~/current_relative_pose	geometry_msgs::msg::PoseStamped	Relative pose of the input_cloud in (param:~/reference_frame_id)

Parameter	Type	Description	Default	Dynamic
~/reference_frame_id	String	Frame ID of the reference input cloud	map	False
~/reference_cloud_topic	String	Topic name of the reference cloud	~/reference	False
~/input_cloud_topic	String	Topic name of the input cloud	~/input	False
~/initial_pose_topic	String	Initial pose topic	~/initial_pose	False
~/transform_epsilon	Double	Transform epsilon of the ndt matching	1.0	True
~/step_size	Double	Stap size of the ndt matching	0.1	True
~/resolution	Double	Resolution of the ndt	1.0	True
~/max_iterations	Int	Maximum nunber of iterations	35	True

2.1.1 Description

pcl_apps::NdtMatchingComponent subscribes input/reference point cloud and estimate relative pose between two point clouds.

2.1.2 Requirements

1. frame_id of the reference_cloud must be same
2. transform_epsilon,step_size,resolution must be over 0
3. max_iterations must be over 1

2.1.3 How to launch with single node

```
ros2 run  pcl_apps ndt_matching_node
```

CHAPTER 3

IO Components

IO Components relates Input/Output features

3.1 Pcd Writer

pcl_apps::PcdWriterComponent subscribe pointcloud topics and save this data as pcd format when the user calls write_pcd service.

Input Topics	Type	Description
(param : ~/input_topic)	sensor_msgs::msg::PointCloud2	Input Point Cloud

Parameter	Type	Description	Default	Dynamic
~/input_topic	String	input topic name	~/input	False

Service	Type	Description
~write_pcd	pcl_apps_msgs::msg::WritePcd	Service for writing point cloud

```
ros2 run pcl_apps pcd_writer_node
```

3.2 Pcd Loader

Pcd Writer Component load pcd file and publish as sensor_msgs::msg::PointCloud2

Output Topics	Type	Description
(param : ~/out_topic)	sensor_msgs::msg::PointCloud2	Output Point Cloud

Parameter	Type	Description	Default	Dynamic
~/output_topic	String	output topic name	~/output	False