**4.2.3 Sensor**

Software packages of various sensors were installed during the system initialize. Since the teleoperation is applicable, reading stable data from the sensors on ROS is the next goal.

**4.2.3.1 Encoder Reading**

The encoder values are sending over SCI-B as they have configured to do in Section ~\ref{subsec:comm with hlpl}. In the HLPL, they have to be read. To read the encoder values, a Python node is written. In this node, the COM port assigned to SCI-B (ttyUSB1) is continuously listened. Since the sending format is the same (start character as “\#”, end character “!”), the node converts the unsigned 16-bit integer values to signed 16-bit values and publishes the converted values on a topic.

**4.2.3.2 IMU Reading**

The related ROS package for Xsens MTi IMU was installed before. Using this package a launch file is created and the node that publishes IMU data is successfully initialized. In order to calibrate the data and make certain settings the software provided by Xsens is used.

**4.2.3.3 LIDAR Reading**

The related package publishes laser scan data on ROS environment. A launch file is created and the data scanned by the LIDAR is simultaneously published on Rviz as in the Figure ~\ref{fig:lidar-sim}.

**4.2.3.4 Kinect Reading**

OpenNI driver packages for Kinect are installed. After a launch file is created, both RGB and point cloud data are streamed to Rviz (Figure ~\ref{fig:kinect-pcl}).