Sensors and Control for Mechatronics Systems
Tutorial 3

Question 1: RGB-D Cameras

1.1 : Load the rosbag to MATLAB workspace using the following command.
bag = rosbag('</file_path/bag name.bag>');

1.2 : Filter out the depth images and RGB images using the select and ***readMessage*** functions.

depthImages = select(bag, 'Topic', '<raw depth image topic>');
firstDepthImage = readMessages(depthImages, 1);

1.3 : Observe how the image data are stored. Using what you learned in Tutorial 1, create a MATLAB RGB image from the first RGB image message published to the raw RGB image topic.

Question 2: RGB-D Cameras with ROS

2.1 : If you are using your own computers, first make sure to install ROS in your Ubuntu desktop environment and follow the steps in the following website to setup Xbox Kinect to observe it's output. Alternatively, you can take turns at the already setup computer.
Link : https://github.com/code-iai/iai_kinect

2.2 : Download the rosbag provided. Play it using ***rosbag play -l <bag name>*** (You need to have a roscore running).

2.3 : Use ***rostopic list*** command to see the available topics. Use ***rostopic info <topic name>*** to obtain more information about each interesting topic. Identify and list down the ROS topics for depth and RGB images.

Use rosbag info <bag name> to observe the data stored in the bag file.
Use rostopic echo -n1 <topic name> to view a message published to that topic.

2.4 : Use ***rosrun rqt_image_view rqt_image_view*** to view the depth and RGB images.

2.5 : The depth image and the RGB image are published separately to two topics. Discuss how an RGB-D image can be obtained from those two images.

2.6 : Launch Rviz, a visualization tool, using ***rosrun rviz rviz***.

Set Global Options → Fixed Frame to camera_depth_frame.
Add a camera view using the GUI.
Set the topic to RGB and Depth image topics and visualize the images.

2.7 :

Set Global Options → Fixed Frame to camera_depth_optical_frame.
Add a PointCloud2 display with topic /camera/depth/points and observe the unregistered point cloud from IR cameras.