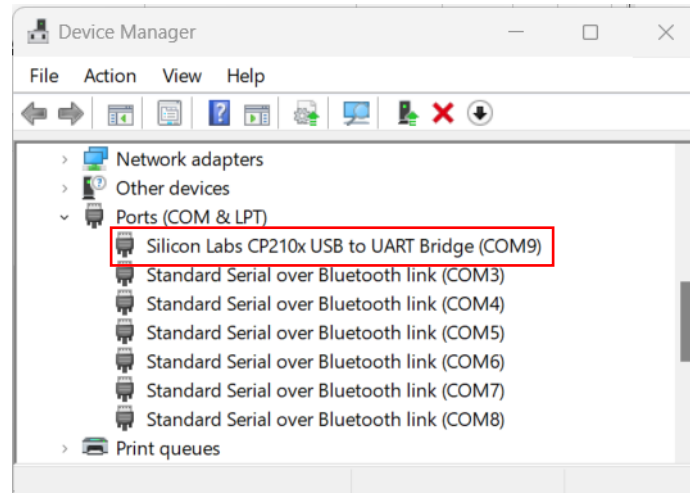# EXPERIMENT 3 (Extra): MAPPING using Lidar Data

_ Requirement: Windows, Visual Studio 2019 (VS2019), MATLAB.

_ Connect LiDar to your laptop/PC → open Device Manager → Expand Ports (COM & LPT) → Remember the COM name of "… USB to UART Bridge" (in below figure, it is COM9).
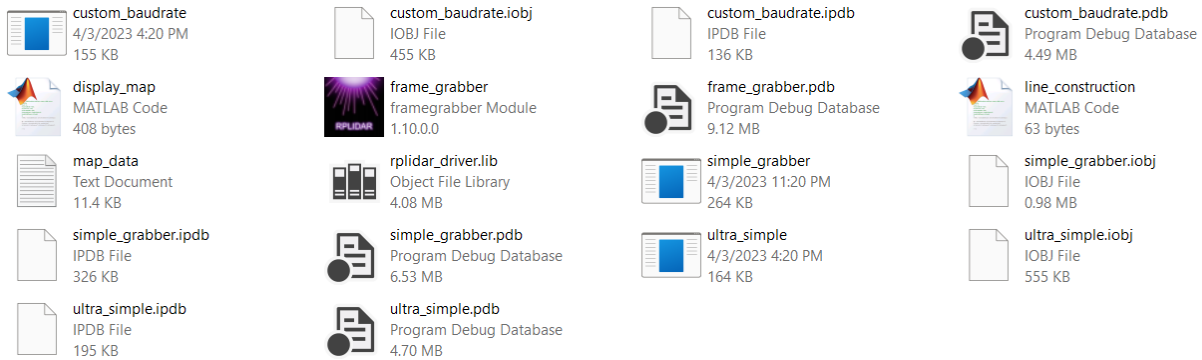

_ Extract rplidar_sdk-master.zip → open sdk_and_demo.sln with VS2019 (path: <your_folder>\rplidar_sdk-master\workspaces\vc14) → confirm trustworthiness of the project folders → Look on the left to see Solution Explorer panel → Right click on [Solution 'sdk_and_demo' (5 of 5 projects)] → Click Build Solution.
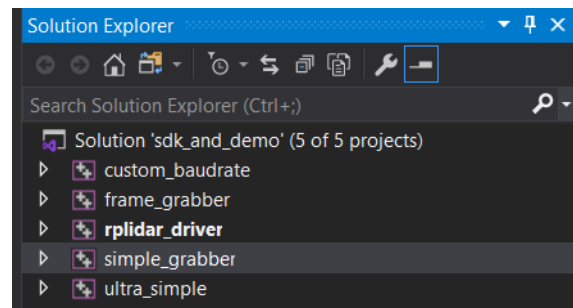
_ In addition, make sure version is 'Release' and build target is 'Win32'.

_ The built outputs are stored in <your_folder>\rplidar_sdk-master\output\win32\Release, open the directory.

custom_baudrate 4/3/2023 4:20 PM 155 KB	custom_baudrate.iobj IOBJ File 455 KB	custom_baudrate.ipdb IPDB File 136 KB	custom_baudrate.pdb Program Debug Database 4.49 MB
display_map MATLAB Code 408 bytes	frame_grabber framegrabber Module 1.10.0.0	frame_grabber.pdb Program Debug Database 9.12 MB	line_construction MATLAB Code 63 bytes
map_data Text Document 11.4 KB	rplidar_driver.lib Object File Library 4.08 MB	simple_grabber 4/3/2023 11:20 PM 264 KB	simple_grabber.iobj IOBJ File 0.98 MB
simple_grabber.ipdb IPDB File 326 KB	simple_grabber.pdb Program Debug Database 6.53 MB	ultra_simple 4/3/2023 4:20 PM 164 KB	ultra_simple.iobj IOBJ File 555 KB
ultra_simple.ipdb IPDB File 195 KB	ultra_simple.pdb Program Debug Database 4.70 MB		

_ Arrange obstacles around the Lidar, where minimum distance should not be less than 15 (cm).

_ Open and run display_map.m with MATLAB. Maximum detectable distance can be adjusted with max_dist variable, but it should not be too large. A map will be displayed. This map is from previous setup, not the map of current setup, process to next step to update the map.
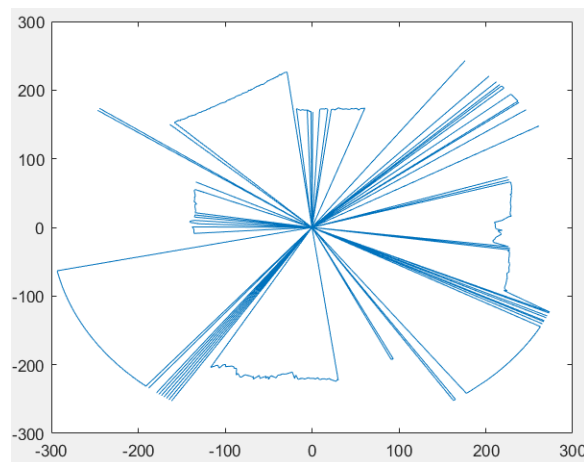
_ Open command window at the folder location, and type:

.\simple_grabber --channel --serial <COM> <baudrate>

Where <COM> is COM name of the bridge, <baudrate> is 115200 for this LiDar. For example:

_ Press enter, wait for 3 seconds, the simple_grabber.exe will be completed and new map is updated and shown on MATLAB Figure 1. If users accept the new map, then Stop MATLAB program and use map_data.txt to process further. Otherwise, run simple_grabber.exe again and again until the displayed map on MATLAB Figure 1 is acceptable.

_ Open and run line_construction.m in MATLAB for line detection of linear regression example. This example shows how to (manually) extract a segment of the map and construct a straight line using two methods: matrix division & gradient descent (can take a while).
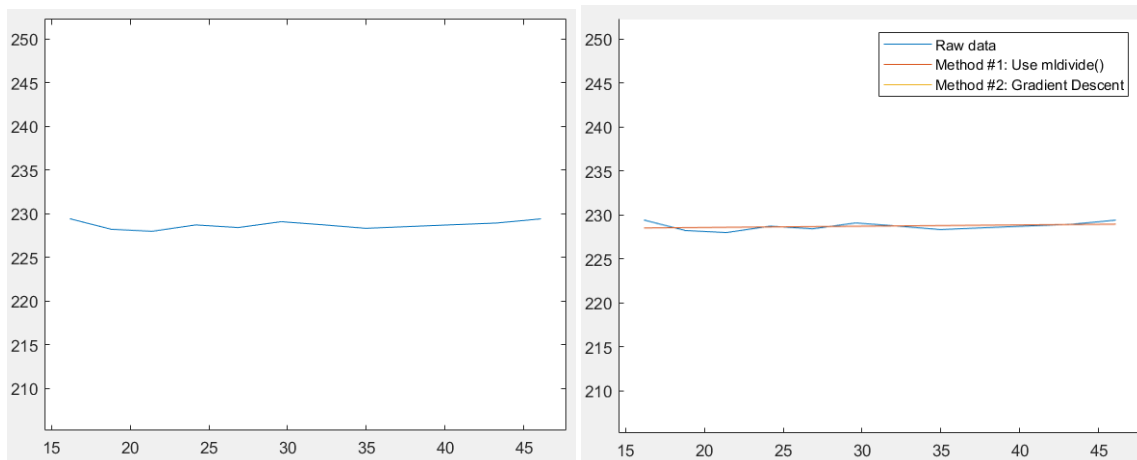
Questions

1. As you follow the instructions above please document your collected data and explain how the Linear Regression work? Please support your answer with your own graph.

2. Using the collected data as the point data as shown in question 1 with other methods rather than Linear Regression to approximate a line function. It is noted that this is not the programming question and please feel free to use any software package or library to support you with this question. Please explain your answers in details.

Resources

_ Lidar SDK was modified from: https://github.com/Slamtec/rplidar_sdk