camera & lidar内外参标定

camera 内参标定

1. 安装包

refer to: https://blog.csdn.net/yuku_1111/article/details/136888421?spm=1011.2124.3001.6209

```
sudo apt install ros-noetic-camera-calibration
```

2.数据

rosbag：
2025-05-07-19-10-49.bag
2025-05-07-19-53-59.bag

3. Start

```
# The first terminal
rosbag play xxx.bag
# The second terminal
rosrun camera_calibration cameracalibrator.py --size 8x10 --square 0.02 --
no-service-check image:=/camera/image_color camera:=/camera
```

等数据充足后，点击calib。

4. 输出结果

intrinsic
1205.587536 0.000000 1245.879481
0.000000 1202.284085 1036.087789
0.000000 0.000000 1.000000

distortion
-0.088614 0.060389 0.000169 0.000279 0.000000

---

lidar2camera外参保定

1. 安装包

```
git clone https://github.com/hku-mars/livox_camera_calib.git
```

2. 数据

2025-05-07-23-08-50.bag - indoor
2025-05-07-23-28-24.bag - indoor
2025-05-06-16-58-04.bag - ourdoor
drive中包含图片和点云信息：
https://drive.google.com/file/d/1W-gjJNI-cOC0HRikUy-fobDBFOQJy0Jj/view?usp=sharing

3. Start

根据livox camera calib的README走。
(本人虽然采用的是multi_calib，但测试时把data_num调整为1。)

最重要的是修改下面的文件内容：

1. `multi_calib.launch`: yaml file调整成自己的（比如calib_arc.yaml）
2. `calib_arc.yaml`: 调整路径&数量（common），调整相机内参，调整yaml路径

src > livox_camera_calib > config > ! calib_arc.yaml

```yaml
# Data path. adjust them!
common:
    # image_path:  "/home/ycj/data/calib/image/old"
    image_path:  "/home/yuku/1workspace/NUS/slam_dong/data/2025-05-06-16-58-04/img"
    # pcd_path:  "/home/ycj/data/calib/pcd/old"
    pcd_path:  "/home/yuku/1workspace/NUS/slam_dong/data/2025-05-06-16-58-04/pcd"
    # result_path:  "/home/ycj/data/calib/extrinsic.txt"
    result_path:  "/home/yuku/1workspace/NUS/slam_dong/data/2025-05-06-16-58-04/calib/extrinsic.txt"
    data_num: 1
# Camera Parameters. Adjust them!
camera:
    # camera_matrix: [791.23841592 , 0.0,      951.7483377,
    #                 0.0,      790.47994986,  529.77259654,
    #                 0.0,      0.0,      1.0     ]
    # dist_coeffs: [-2.86200587e-01, 7.91383814e-02, -5.35146722e-04, -2.60140203e-04, -9.32708294e-03]
    camera_matrix: [1205.587536 , 0.0,      1245.879481,
                    0.0,      1202.284085,  1036.087789,
                    0.0,      0.0,      1.0     ]
    dist_coeffs: [-0.088614, 0.060389, 0.000169, 0.000279, 0.000000]

# Calibration Parameters.!
calib:
    # calib_config_file: "/home/ycj/catkin_ws/src/livox_camera_calib/config/config_outdoor.yaml"
    calib_config_file: "/home/yuku/1workspace/NUS/slam_dong/src/livox_camera_calib/config/config_outdoor.yaml
    use_rough_calib: true # set true if your initial_extrinsic is bad
```

3. `config_outdoor.yaml`: 调整ExtrinsicMat的data为预测的初始内参。后面的相机与点云特征提取参数可以根据情况进行调整。比如，让图像对边界更加敏感：
   Canny.gray_threshold: 10
   Canny.len_threshold: 100

4. 输出结果

extrinsic
-0.00280721 -0.999801 -0.019766 -0.0947847
-0.0102422 0.0197938 -0.999752 -0.0191468

0.999944 -0.00260407 -0.0102958 -0.0863761
0 0 0 1