建图模块启动:

roslaunch lego_loam run.launch

```
.. logging to /home/yingwang/.ros/log/af07f5a4-b74d-11e9-9692-
3c6aa73a0485/roslaunch-yingwang-ThinkPad-T480-6507.log
Checking log directory for disk usage. This may take awhile.
Press Ctrl-C to interrupt
Done checking log file disk usage. Usage is <1GB.

started roslaunch server http://yingwang-ThinkPad-T480:39135/

SUMMARY
========

PARAMETERS
 * /robot_description: <?xml version="1....
 * /rosdistro: kinetic
 * /rosversion: 1.12.14
 * /use_gui: False
 * /use_sim_time: True

NODES
  /
    base_link_to_camera (tf/static_transform_publisher)
    camera_init_to_map (tf/static_transform_publisher)
    featureAssociation (lego_loam/featureAssociation)
    imageProjection (lego_loam/imageProjection)
    joint_state_publisher (joint_state_publisher/joint_state_publisher)
    mapOptmization (lego_loam/mapOptmization)
    robot_state_publisher (robot_state_publisher/state_publisher)
    rviz (rviz/rviz)
    transformFusion (lego_loam/transformFusion)

auto-starting new master
process[master]: started with pid [6518]
ROS_MASTER_URI=http://localhost:11311

setting /run_id to af07f5a4-b74d-11e9-9692-3c6aa73a0485
process[rosout-1]: started with pid [6531]
started core service [/rosout]
process[joint_state_publisher-2]: started with pid [6538]
process[robot_state_publisher-3]: started with pid [6548]
process[rviz-4]: started with pid [6557]
process[camera_init_to_map-5]: started with pid [6559]
process[base_link_to_camera-6]: started with pid [6576]
/opt/ros/kinetic/lib/python2.7/dist-packages/roslib/packages.py:447:
UnicodeWarning: Unicode equal comparison failed to convert both arguments
to Unicode - interpreting them as being unequal
  if resource_name in files:
```

```
process[imageProjection-7]: started with pid [6626]
process[featureAssociation-8]: started with pid [6628]
process[mapOptmization-9]: started with pid [6629]
[ INFO] [1564987989.575003088]: ----> Feature Association Started.
process[transformFusion-10]: started with pid [6637]
[ INFO] [1564987989.620159686]: ----> Image Projection Started.
[ INFO] [1564987989.628667889]: ----> Transform Fusion Started.
[ INFO] [1564987989.672259968]: ----> Map Optimization Started.
Vocabulary loaded!
```

出现 **Vocabulary loaded!** 说明建图相关的所有节点启动成功

run.launch说明

```xml
<launch>

    <!--- Sim Time -->
    <param name="/use_sim_time" value="true" /> <!---离线跑需要--->

    <!--显示一个红色的小车,只是为了好看没有实质性功能--->
    <arg name="model" />
      <arg name="gui" default="False" />
      <param name="robot_description" textfile="$(find
lego_loam)/urdf/car.urdf" />
      <param name="use_gui" value="$(arg gui)"/>
      <node name="joint_state_publisher" pkg="joint_state_publisher"
type="joint_state_publisher" ></node>
      <node name="robot_state_publisher" pkg="robot_state_publisher"
type="state_publisher" />


    <!--- Run Rviz-->
    <node pkg="rviz" type="rviz" name="rviz" args="-d $(find
lego_loam)/launch/test.rviz" />

    <!--- TF -->
    <!--- 建图时雷达坐标系和base_link坐标系会发生变换, 这两个静态tf是为了将tf变回来-
-->
    <node pkg="tf" type="static_transform_publisher"
name="camera_init_to_map"  args="0 0 0 1.570795   0       1.570795 /map
/camera_init 10" />
    <node pkg="tf" type="static_transform_publisher"
name="base_link_to_camera" args="0 0 0 -1.570795 -1.570795 0       /camera
/base_link   10" />

    <!--- LeGO-LOAM -->
    <!--- 建图用的四个节点--->
    <node pkg="lego_loam" type="imageProjection"    name="imageProjection"
output="screen"/>
    <node pkg="lego_loam" type="featureAssociation"
name="featureAssociation" output="screen"/>
```

```xml
    <node pkg="lego_loam" type="mapOptmization"     name="mapOptmization"
output="screen"/>
    <node pkg="lego_loam" type="transformFusion"    name="transformFusion"
output="screen"/>

</launch>
```

定位模块启动

`roslaunch locate locate.launch`

```
yingwang@yingwang-ThinkPad-T480:~/ros_ws/locate_ws$ roslaunch locate
locate.launch
... logging to /home/yingwang/.ros/log/b594a7e8-b750-11e9-9692-
3c6aa73a0485/roslaunch-yingwang-ThinkPad-T480-11069.log
Checking log directory for disk usage. This may take awhile.
Press Ctrl-C to interrupt
Done checking log file disk usage. Usage is <1GB.

started roslaunch server http://yingwang-ThinkPad-T480:39853/

SUMMARY
========

PARAMETERS
 * /corner_map: /home/yingwang/ro...
 * /final_map: /home/yingwang/ro...
 * /robot_description: <?xml version="1....
 * /rosdistro: kinetic
 * /rosversion: 1.12.14
 * /surf_map: /home/yingwang/ro...
 * /use_gui: False
 * /use_sim_time: True

NODES
  /
    base_link_to_camera (tf/static_transform_publisher)
    camera_init_to_map (tf/static_transform_publisher)
    camerainit_to_linit (tf/static_transform_publisher)
    featureAssociation (locate/featureAssociation)
    imageProjection (locate/imageProjection)
    joint_state_publisher (joint_state_publisher/joint_state_publisher)
    mapOptmization (locate/mapOptmization)
    robot_state_publisher (robot_state_publisher/state_publisher)
    rviz (rviz/rviz)
    transformFusion (locate/transformFusion)

auto-starting new master
process[master]: started with pid [11079]
ROS_MASTER_URI=http://localhost:11311
```

```
setting /run_id to b594a7e8-b750-11e9-9692-3c6aa73a0485
process[rosout-1]: started with pid [11092]
started core service [/rosout]
process[joint_state_publisher-2]: started with pid [11103]
process[robot_state_publisher-3]: started with pid [11116]
process[rviz-4]: started with pid [11118]
process[camera_init_to_map-5]: started with pid [11126]
process[base_link_to_camera-6]: started with pid [11140]
process[camerainit_to_linit-7]: started with pid [11160]
process[imageProjection-8]: started with pid [11185]
process[featureAssociation-9]: started with pid [11199]
process[mapOptmization-10]: started with pid [11216]
process[transformFusion-11]: started with pid [11233]
[ INFO] [1564989289.031373366]: ----> Image Projection Started.
[ INFO] [1564989289.045516455]: ----> Feature Association Started.
[ INFO] [1564989289.075153540]: ----> Transform Fusion Started.
[ INFO] [1564989289.081592674]: ----> Map Optimization Started.
```

locate部分代码是在建图代码的基础上改的,节点个数和建图相同，但是Map Optimization是将点云与载入的地图匹配，没有因子图优化的功能

locate.launch说明

launch文件和上面的相似、由于定位是实时运行所有不需要`<param name="/use_sim_time" value="true" />`,若要离线测试可以开启