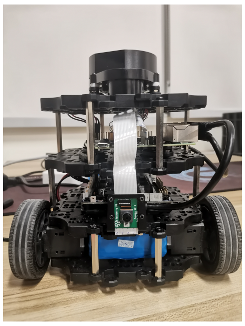
EE346_FinalLab_JefferySherlock

Description

This project is the final lab in course EE346 ***Mobile Robot Navigation and Control***, based on robot **turtlebot burger** and computer operating system **ubuntu18.04**.



This project implemented camera calibration, aruco tag detection, automatic navigation, lane following and other functions.

The details are contained in the file ***Final_Report.pdf***.
The following tutorial will guide you on how to use these programs.

The main programs are in directory **turtlebot3_autorace2020/turtlebot3_autorace_traffic_light**

Camera calibration

Calibrating the camera is very important for autonomous driving. The following describes how to simply calibrate the camera step by step.

1. Launch **roscore** on PC

```
roscore
```

2. Trigger the camera on turtlebot

```
roslauch turtlebot3_autorace_traffic_light_camera turtlebot3_autorace_camera_pi.launch
```

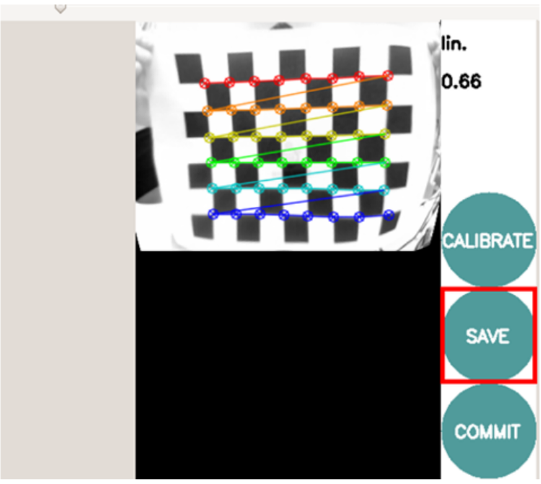
3. Execute **rqt_image_view** on PC

```
rqt_image_view
```

4. Select **/camera/image/compressed** (or **/camera/image/**) topic on the check box
5. Run a intrinsic camera calibration launch file on PC

```
export AUTO_IN_CALIB=calibration
export GAZEBO_MODE=false
roslaunch turtlebot3_autorace_traffic_light_camera turtlebot3_autorace_intrinsic_camera_calibration.launch
```

6. Use the checkerboard to calibrate the camera, and click **CALIBRATE**. After calibration, click **Save** to save the intrinsic calibration data.



7. **calibrationdata.tar.gz** folder will be created at **/tmp** folder. Extract **calibrationdata.tar.gz** folder, and open **ost.yaml**. Copy and paste the data from **ost.yaml** to **camerav2_320x240_30fps.yaml**.

Aruco code detection

1. Launch **roscore** on PC

```
roscore
```

2. Trigger the camera on turtlebot

```
roslauch turtlebot3_autorace_traffic_light_camera
turtlebot3_autorace_camera_pi.launch
```

3. Run a intrinsic camera calibration launch file on PC

```
export AUTO_IN_CALIB=action
export GAZEBO_MODE=false
roslaunch turtlebot3_autorace_traffic_light_camera
turtlebot3_autorace_intrinsic_camera_calibration.launch
```

4. Run a python file to detect the Aruco code

```
# if the file can not be executed, please change the permission by
# chmod u+x speaker.py
rosrun turtlebot3_autorace_traffic_light_detect speaker.py
```

Navigation

Before starting the program, you need to put turtlebot on P1.

1. Launch **roscore** on PC

```
roscore
```

2. If the **bringup** is not running on turtlebot, launch the **bringup** on turtlebot
3. Launch the navigation

```
export TURTLEBOT3_MODEL=burger
roslaunch turtlebot3_navigation turtlebot3_navigation.launch map_file:=$HOME/map.yaml
```

4. Run a python file to publish goals to turtlebot

```
rosurn turtlebot3_navigation pub_navga_dst.py
```

Lab7

1. Launch **roscore** on PC

```
roscore
```

2. Trigger the camera on turtlebot

```
roslauch turtlebot3_autorace_traffic_light_camera turtlebot3_autorace_camera_pi.launch
```

3. Run a intrinsic camera calibration launch file on PC

```
export AUTO_IN_CALIB=action
export GAZEBO_MODE=false
roslaunch turtlebot3_autorace_traffic_light_camera turtlebot3_autorace_intrinsic_camera_calibration.launch
```

4. Launch **Bringup** on turtlebot
5. Run the program to finish "lane following"

```
rosrun turtlebot3_autorace_traffic_light_detect follow_lane_final3.py
```

6. Run the program to detect aruco tag

```
rosrun turtlebot3_autorace_traffic_light_detect speaker.py
```