实验报告

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【实验目的】

利用 Aruco 实现相机位姿估计

【实验过程】

1. **配置 OpenCV 与 Aruco**

OpenCV

安装依赖库

```
sudo apt-get install build-essential libgtk2.0-dev libgtk-3-dev libavcodec-dev libavformat-dev libjpeg-dev libswscale-dev libtiff5-dev
```

下载源码，解压安装

```
unzip opencv.zip
mv opencv-master opencv
cd opencv
mkdir build
cd build
```

编译 release 模式下的 OpenCV

```
cmake -D CMAKE_BUILD_TYPE=Release -D OPENCV_GENERATE_PKGCONFIG=YES -D CMAKE_INSTALL_PREFIX=/usr/local/OpenCV/Release -D WITH_FFMPEG=ON ..
```

编译

```
make -j8
```

安装

```
sudo make install
```

环境配置

设置库的搜索路径

```
sudo gedit /etc/ld.so.conf.d/opencv.conf
```

在 opencv.conf 添加函数库所在目录

```
/usr/local/OpenCV/Debug/lib
/usr/local/OpenCV/Release/lib
```

将/etc/ld.so.conf.d 中的数据读入缓存

```
sudo ldconfig
```

添加 pkg-config 环境变量，便于 pkg-config 找到*.pc 文件

```
cd /usr/local/OpenCV/Release/lib/pkgconfig
sudo mv opencv4.pc opencv4_release.pc
```
把路径设置在环境变量中

```
export
PKG_CONFIG_PATH=/usr/local/OpenCV/Release/lib/pkgconfig:$PKG_CONFIG_PATH
```
激活

```
source /etc/profile
```
验证是否成功

```
pkg-config --libs opencv4_release
```
成功则显示

```
-L/usr/local/OpenCV/Release/lib -lopencv_gapi -lopencv_highgui -lopencv_ml
-lopencv_objdetect -lopencv_photo -lopencv_stitching -lopencv_video -
lopencv_calib3d -lopencv_features2d -lopencv_dnn -lopencv_flann -
lopencv_videoio -lopencv_imgcodecs -lopencv_imgproc -lopencv_core
```
测试

```
pkg-config --modversion opencv4
```
应当会输出 OpenCV 版本信息

Aruco

在官网下载源码并解压安装即可

```
unzip aruco-3.0.12.zip
cd aruco-3.0.12
mkdir build
cd build
cmake ..
make -j4 install
```

2. 相机标定

进入标定文件

```
cd aruco-3.1.12/
cd build/
cd utils_calibration/
```

找到 aruco_calibration_grid_board_a4.pdf 文件，打印出来

运行标定程序

```
./aruco_calibration live:0 out_camera_calibration.yml -m
aruco_calibration_grid_board_a4.yml -size 0.038
```

live 代表实时模式

0 为摄像头标号

```
ls /dev/video*
```

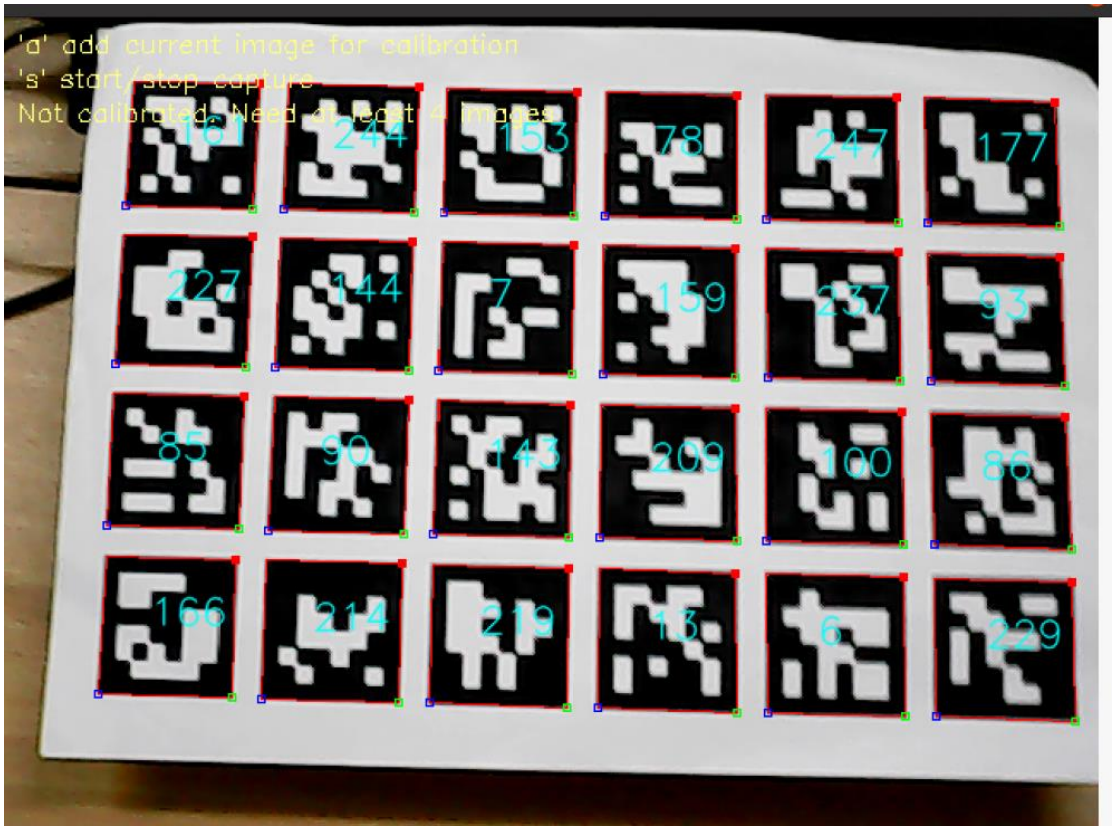
可查看摄像头

0.038 为单个 marker 边长（单位为米）

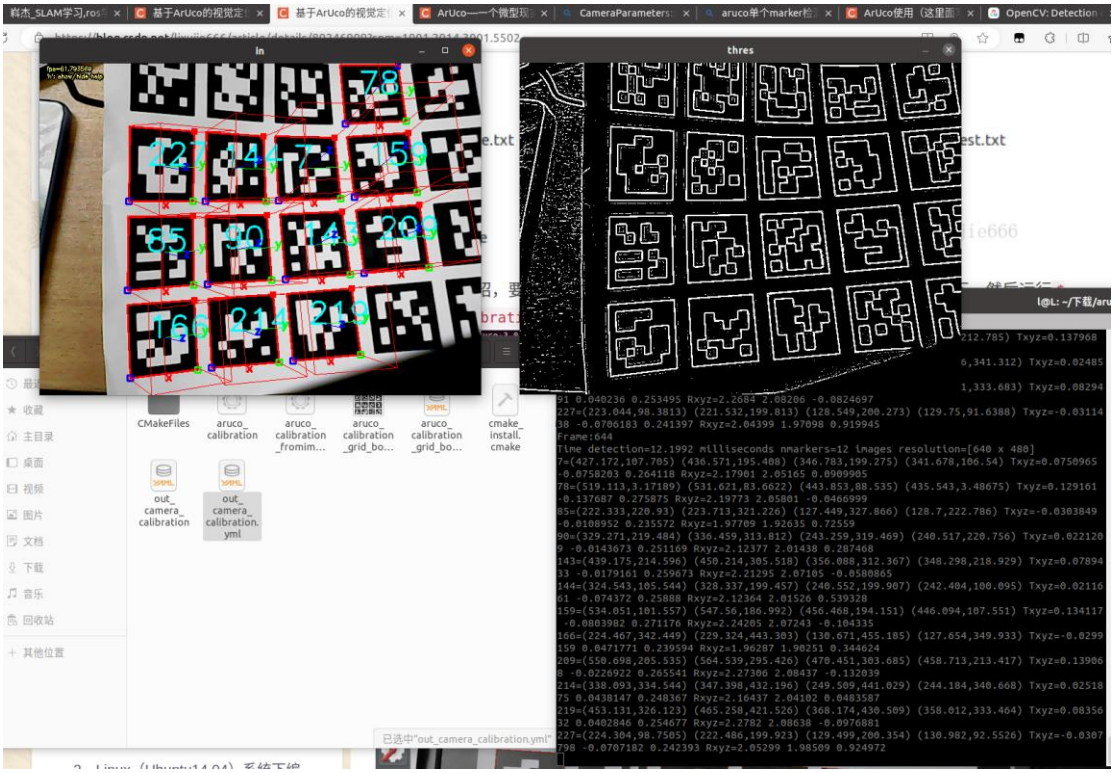
按照左上角提示标定

注：每次捕捉图像尽量保证角度与距离不同，减少图片相关性，以此减少误差

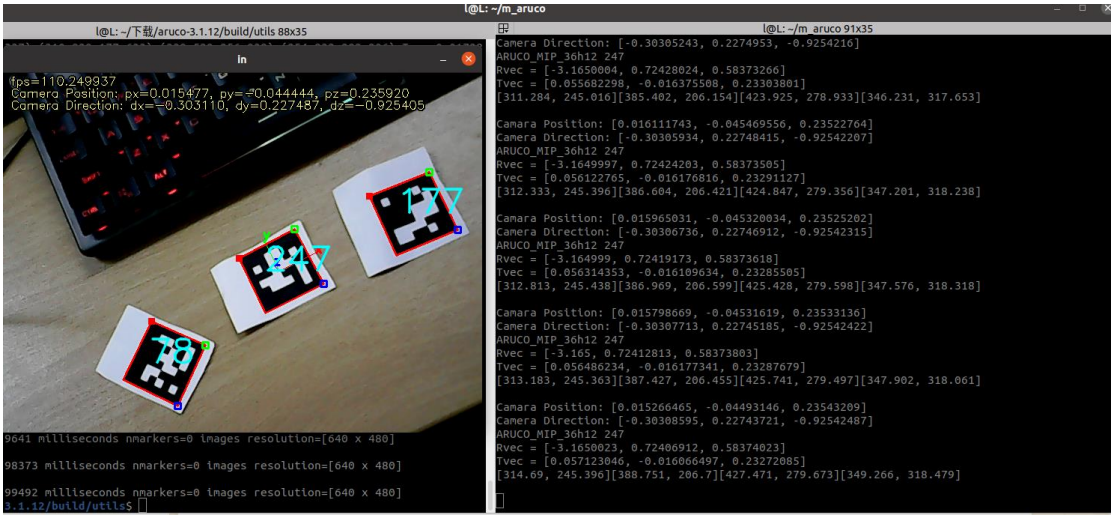
相机标定文件保存在当前文件夹下



3. 运行 aruco_test 检测多个 marker



4. 用单个 marker 实现相机的位姿估计



【实验结果】

1. 成功配置 OpenCV 4.5.1 与 Aruco 3.1.12
2. 完成相机标定
3. 利用单个 marker 实现相机位姿估计