

# ReadMe

## 1. 查询摄像头设备信息，并赋予权限

```
→ aruco_detect lsusb
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 001 Device 005: ID 046d:c534 Logitech, Inc. Unifying Receiver
Bus 001 Device 006: ID 05e3:0749 Genesys Logic, Inc. KS2A543
Bus 001 Device 008: ID 0b95:1790 ASIX Electronics Corp. AX88179 Gigabit Ethernet
Bus 001 Device 004: ID 05e3:0610 Genesys Logic, Inc. 4-port hub
Bus 001 Device 003: ID 1a40:0101 Terminus Technology Inc. Hub
Bus 001 Device 002: ID 2304:2334 Pinnacle Systems, Inc. KS2A543
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
```

赋予权限（这里的001/002，由上述usb端口查询得到，每次插拔开机都可能不一样）

```
→ aruco_detect sudo chmod o+w /dev/bus/usb/001/002
[sudo] password for nv:
```

## 2. 将相机的数据，转化成ROStopic的形式输出。

```
roslaunch camera_test.launch
```

注意：如果之前运行过该指令，断开后再次运行会报下列错误。可能是该包的bug，没有正确关闭usb的数据流。

```
ROS_MASTER_URI=http://localhost:11311

process[camera/mycam-1]: started with pid [10984]
unsupported descriptor subtype VS_COLORFORMAT
unsupported descriptor subtype VS_COLORFORMAT
attempt to release unclaimed interface 0
[ERROR] [1694143025.228169792]: Can't open /dev/bus/usb/001/002: Busy (-6)
[ WARN] [1694143025.229453217]: [camera] does not match name narrow_stereo in file /home/nv/camera_info.yaml
[camera/mycam-1] process has died [pid 10984, exit code 255, cmd /opt/ros/noetic/lib/libuvc_camera/camera_node __name:=mycam __log:=/home/nv/.ros/log/cfe64ad8-4ded-11ee-a30d-c0e43484fe73/camera-mycam-1.log]
```

目前采用的解决方法是，人为关闭该usb文件的进程，输入如下指令：

```
fuser /dev/bus/usb/001/002 -k
```

正常启动后，没有红色报错。但是要注意下面的camera calibration file路径是否正确，如果不正确会导致最后相对坐标输出为Nan。

```

NODES
  /camera/
    mycam (libuvc_camera/camera_node)

ROS_MASTER_URI=http://localhost:11311

process[camera/mycam-1]: started with pid [11214]
unsupported descriptor subtype VS_COLORFORMAT
unsupported descriptor subtype VS_COLORFORMAT
attempt to claim already-claimed interface 1
[ WARN] [1694143449.785813313]: Camera calibration file /home/nv/camera_info.yaml not found.
[ WARN] [1694143449.787026080]: Unable to set scanning_mode to 0
[ WARN] [1694143449.789355898]: Unable to set auto_exposure_priority to 0
[ WARN] [1694143449.790828135]: Unable to set exposure_absolute to 1
[ WARN] [1694143449.792508543]: Unable to set auto_focus to 1
Corrupt JPEG data: 32 extraneous bytes before marker 0xdb

```

正常运行显示如下：

```

NODES
  /camera/
    mycam (libuvc_camera/camera_node)

ROS_MASTER_URI=http://localhost:11311

process[camera/mycam-1]: started with pid [11763]
unsupported descriptor subtype VS_COLORFORMAT
unsupported descriptor subtype VS_COLORFORMAT
attempt to claim already-claimed interface 1
[ WARN] [1694143744.134698117]: [camera] does not match name narrow_stereo in file /home/nv/aruco_detector/camera_info.yaml
[ WARN] [1694143744.135958792]: Unable to set scanning_mode to 0
[ WARN] [1694143744.139549254]: Unable to set auto_exposure_priority to 0
[ WARN] [1694143744.140996115]: Unable to set exposure_absolute to 1
[ WARN] [1694143744.142725230]: Unable to set auto_focus to 1
Corrupt JPEG data: 32 extraneous bytes before marker 0xdb

```

启动成功后可以看到如下rostopic，可以通过rqt\_image\_view可视化输出结果。

```

→ ~ rostopic list
/camera/camera_info
/camera/image_raw
/camera/image_raw/compressed
/camera/image_raw/compressed/parameter_descriptions
/camera/image_raw/compressed/parameter_updates
/camera/image_raw/compressedDepth
/camera/image_raw/compressedDepth/parameter_descriptions
/camera/image_raw/compressedDepth/parameter_updates
/camera/image_raw/theora
/camera/image_raw/theora/parameter_descriptions
/camera/image_raw/theora/parameter_updates
/camera/mycam/parameter_descriptions
/camera/mycam/parameter_updates
/rosout
/rosout_agg

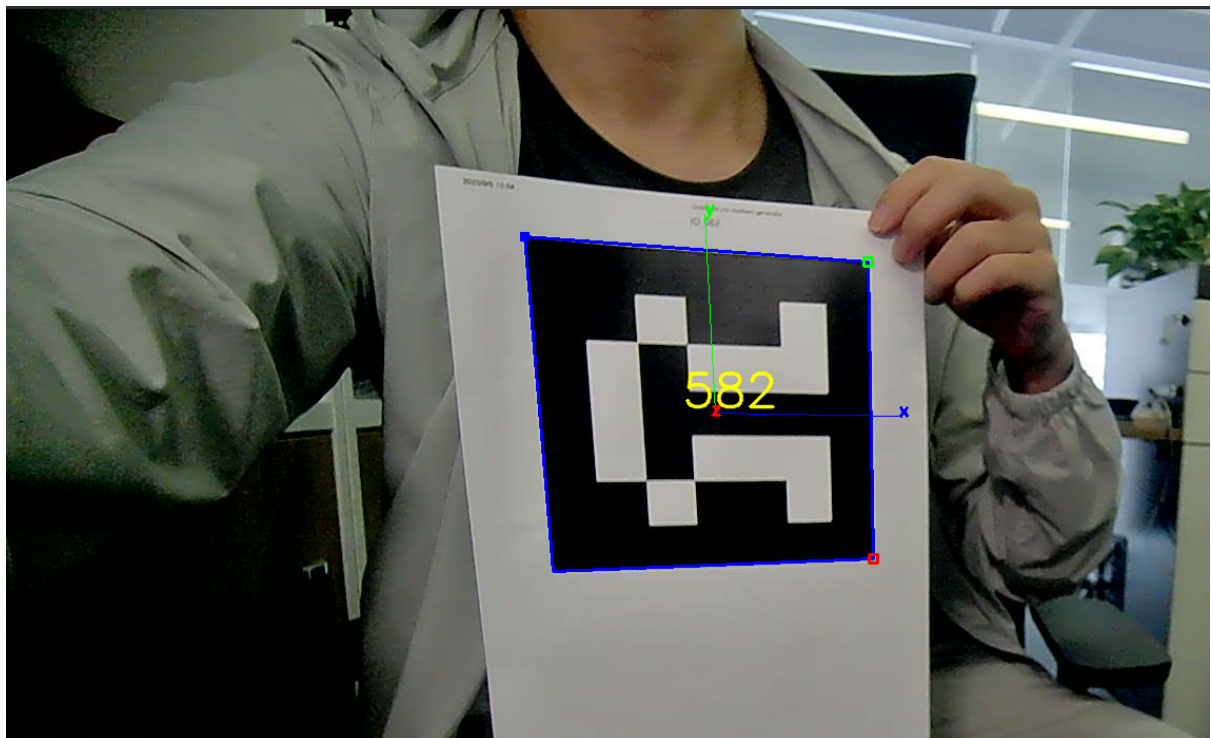
```

### 3. 开启aruco\_ros，对marker进行识别。

```
# 不会可视化  
sh aruco_detect.sh  
  
# 当需要显示检测效果 后面增加 参数true  
sh aruco_detect.sh true
```

```
# aruco_detect.sh 内部代码（解释说明用）  
# 打开aruco_ros的识别节点  
roslaunch aruco_ros single_test.launch  
# 可视化识别结果  
roslaunch image_view image_view image:=/aruco_single/result
```

识别结果图



single\_test.launch 文件说明

```
<launch>
<arg name="markerId" default="582"/>
<arg name="markerSize" default="0.034"/> <!-- in m -->
<arg name="eye" default="left"/>
<arg name="marker_frame" default="aruco_marker_frame"/>
<arg name="ref_frame" default="" /> <!-- leave empty and the pose will be published wrt param parent_name -->
<arg name="corner_refinement" default="LINES" /> <!-- NONE, HARRIS, LINES, SUBPIX -->

<node pkg="aruco_ros" type="single" name="aruco_single">
  <remap from="/camera_info" to="/camera/camera_info" />
  <remap from="/image" to="/camera/image_raw" />
  <param name="image_is_rectified" value="True"/>
  <param name="marker_size" value="$(arg markerSize)"/>
  <param name="marker_id" value="$(arg markerId)"/>
  <param name="reference_frame" value="$(arg ref_frame)"/> <!-- frame in which the marker pose will be referred -->
  <param name="camera_frame" value="camera"/>
  <param name="marker_frame" value="$(arg marker_frame)" />
  <param name="corner_refinement" value="$(arg corner_refinement)" />
</node>
</launch>
```

需要指定marker的id, 以及marker的大小。(本实验使用id 582的marker 大小0.034米, 这个可以在其他资料的链接中生成。)

剩下的两个topic名, 分别包含相机的参数信息, 以及相机的输出图像。

## 4. 从rostopic 中获取相对位姿

```
rostopic echo /aruco_single/pose
```

```
header:
  seq: 1657
  stamp:
    secs: 1694144300
    nsecs: 42289542
  frame_id: "camera"
pose:
  position:
    x: -0.013410697691142559
    y: -0.03314591571688652
    z: 0.12851756811141968
  orientation:
    x: 0.9914319269753713
    y: -0.0017214341108578834
    z: 0.057154228090083796
    w: -0.1174443061622428
---
```

3.0口的消息发布频率为

```

average rate: 46.838
  min: 0.012s max: 0.330s std dev: 0.01764s window: 520
average rate: 47.194
  min: 0.012s max: 0.330s std dev: 0.01685s window: 572
average rate: 47.560
  min: 0.012s max: 0.330s std dev: 0.01619s window: 624
average rate: 47.871
  min: 0.012s max: 0.330s std dev: 0.01559s window: 676
average rate: 48.110
  min: 0.012s max: 0.330s std dev: 0.01506s window: 727

```

## 5. 性能分析

使用3.0的usb接口，启动rostopic传输后，帧率为50fps，单核占用100%。

```

→ aruco_detect rostopic hz /camera/image_raw
subscribed to [/camera/image_raw]
average rate: 50.828
  min: 0.015s max: 0.025s std dev: 0.00244s window: 50
average rate: 50.746
  min: 0.015s max: 0.026s std dev: 0.00239s window: 100
average rate: 50.652
  min: 0.015s max: 0.026s std dev: 0.00234s window: 151
^C^Caverage rate: 50.510

```

```

1 [|||||] 13.5% 5 [|||||] 94.8%
2 [|||] 2.7% 6 [|||||] 4.4%
3 [|||||] 18.1% 7 [|||] 0.6%
4 [|||||] 9.9% 8 [|||||] 3.8%
Mem[|||||] 2.20G/15.0G Tasks: 159, 624 thr; 2 running
Swp[|||||] 0K/7.51G Load average: 1.75 1.07 0.47
Uptime: 00:05:34

PID USER PRI NI VIRT RES SHR S CPU% MEM% TIME+ Command
3769 nv 20 0 678M 99524 47788 S 101.0 0.6 4:01.68 /opt/ros/noetic/lib/libuvccamera/camera_node __name=mycan __log=/home/nv/.ros/l
3781 nv 20 0 678M 99524 47788 R 98.7 0.6 3:53.94 /opt/ros/noetic/lib/libuvccamera/camera_node __name=mycan __log=/home/nv/.ros/l
2744 nv 20 0 4596M 296M 111M S 17.9 1.9 0:30.52 /usr/bin/gnome-shell

```

aruco码识别基本不占用CPU算力。

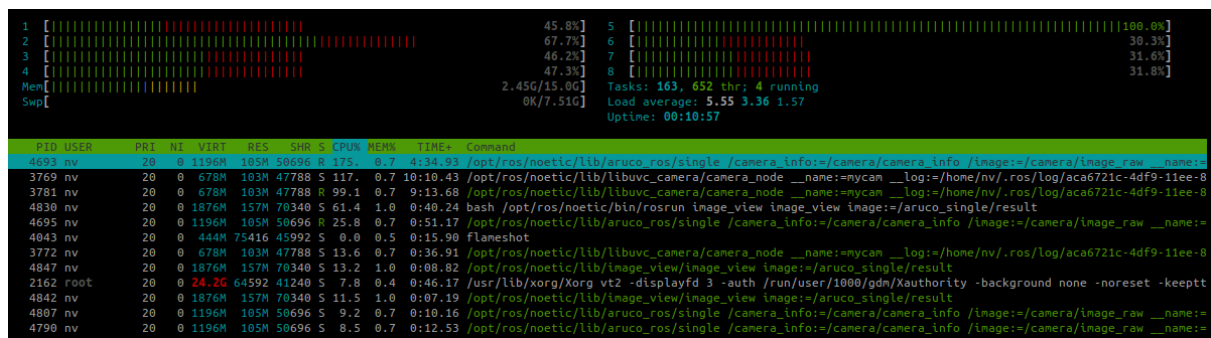
```

1 [|||||] 22.6% 5 [|||||] 4.6%
2 [|||||] 15.9% 6 [|||||] 100.0%
3 [|||||] 20.9% 7 [|||||] 2.0%
4 [|||||] 15.5% 8 [|||||] 5.2%
Mem[|||||] 2.28G/15.0G Tasks: 161, 627 thr; 4 running
Swp[|||||] 0K/7.51G Load average: 1.59 1.23 0.59
Uptime: 00:07:02

PID USER PRI NI VIRT RES SHR S CPU% MEM% TIME+ Command
3769 nv 20 0 678M 103M 47788 S 116.0 0.7 5:13.08 /opt/ros/noetic/lib/libuvccamera/camera_node __name=mycan __log=/home/nv/.ros/log/aca6721c-4df9-1
3781 nv 20 0 678M 103M 47788 R 98.2 0.7 5:21.46 /opt/ros/noetic/lib/libuvccamera/camera_node __name=mycan __log=/home/nv/.ros/log/aca6721c-4df9-1
4693 nv 20 0 568M 88544 48372 S 19.2 0.6 0:07.40 /opt/ros/noetic/lib/aruco_ros/single /camera_info=/camera/camera_info /image=/camera/image_raw __n
2744 nv 20 0 4596M 295M 111M S 16.0 1.9 0:36.06 /usr/bin/gnome-shell
3772 nv 20 0 678M 103M 47788 S 13.5 0.7 0:05.51 /opt/ros/noetic/lib/libuvccamera/camera_node __name=mycan __log=/home/nv/.ros/log/aca6721c-4df9-1
4695 nv 20 0 568M 88544 48372 S 13.5 0.6 0:04.46 /opt/ros/noetic/lib/aruco_ros/single /camera_info=/camera/camera_info /image=/camera/image_raw __n
2162 root 20 0 24.2G 54720 33048 S 4.5 0.3 0:17.52 /usr/lib/xorg/Xorg vt2 -displayfd 3 -auth /run/user/1000/gdm/Xauthority -background none -noreset -k
3779 nv 20 0 678M 103M 47788 S 3.8 0.7 0:09.35 /opt/ros/noetic/lib/libuvccamera/camera_node __name=mycan __log=/home/nv/.ros/log/aca6721c-4df9-1
3830 nv 20 0 13640 4260 2516 R 3.2 0.0 0:07.13 htop

```

开启图像显示后，CPU算力激增（尽量关闭）



使用2.0进行测试没有明显差别。

## 其他资料

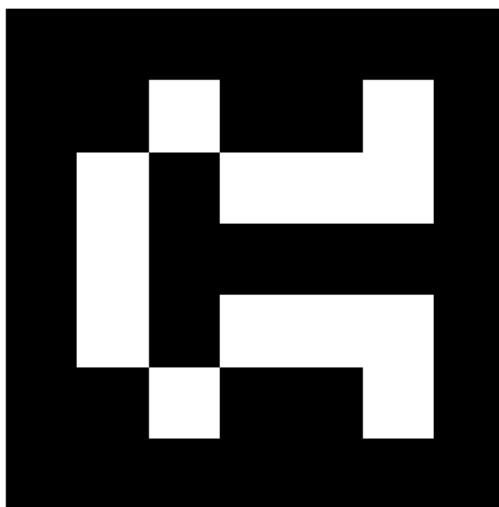
[生成aruco marker的网站](#)

### ArUco markers generator!

Dictionary:

Marker ID:

Marker size, mm:



[save](#) this marker as SVG, or [open](#) standard browser's print dialog to print or get the PDF.

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