collabot_manual_EN_1030

[Program Execution]

0. Connect Two cameras with the notebook. Check the port number of logitech camera.

1. **roscore** : Open terminal, type **roscore** and Enter .
2. **runopt** : Open new terminal, type **runopt** and Enter.
3. It takes 5~6 sec for all modules to be ready.

[runopt description]

1. Terminator 4-layout
    a. main script(Upper left) : When user select a book through the mobile app, that book will be added in task queue. Task in the task queue will be processed sequentially and executing information will be printed.

    >> Bookcase open → Wait Open → Call Detector → Wait Respond → (old) LED ON, OFF for Debug → Bookcase close

    b. OpenCR Module(Lower left) : Print “Command Received” on terminal when user select a book or receiving motor command by main.

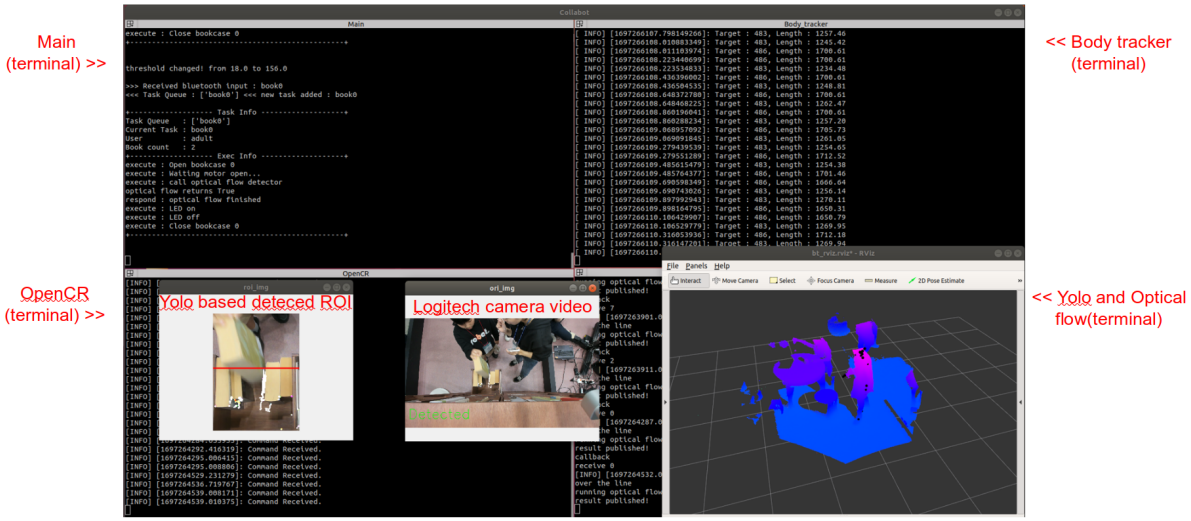
    c. Body Tracking Module(Upper right) : Perform the skeleton tracking from the Azure Kinect Pointcloud data.

    d. Detection Module(Lower right) : When main call the detector module, logitech camera will detect the open drawer and perform Optical Flow to judge whether the book is gone or not.
2. RVIZ
    a. Visualize the real time pointcloud and skeleton tracking data of Azure Kinect camera.
3. rqt - dynamic reconfigure
    a. Manually set the Rotation and Translation matrix of Azure Kinect Pointcloud data to estimate body length.

b. Save and Load Rotation, Translation preset.

c. It can control adult / child threshold In Collabot_main tab.

4. OpenCV window (ori_img , roi_img) : for Detection Module Visualization



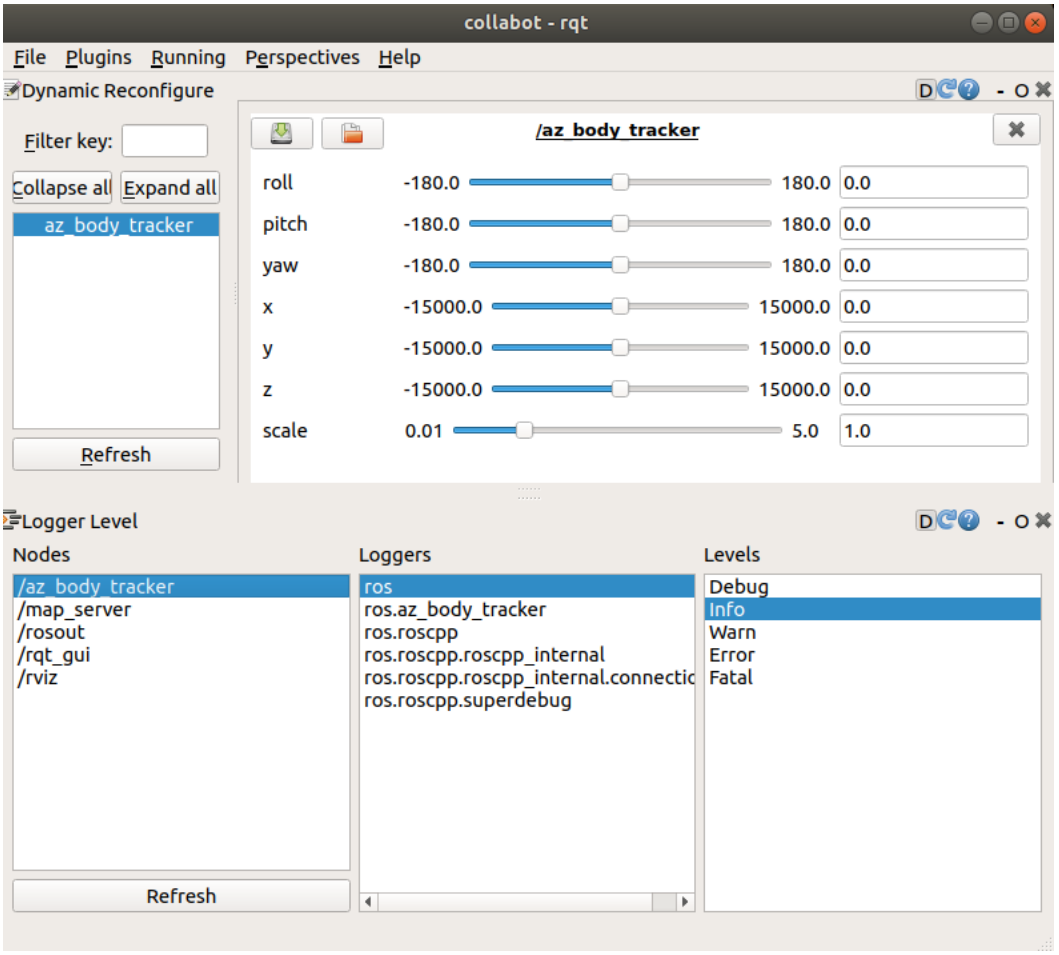
Camera H/W pose setting

Azure Kinect - Sliver

0. Azure Kinect need two cable, one is C-port with notebook usb connection, another is O-shape power adapter cable.

* Do once when environment changed.

1. Open terminal, type **runopt** or **roslaunch az_body_tracker run.launch** to run the body tracking module and watch RVIZ.
2. Make sure the Bookcase does not show in pointcloud data as much as possible. (It can cause FOV loss by occlusion)
3. Set the angle of camera to ground plane 60 degree approximately.
4. while watching RVIZ result, adjust camera angle slightly toward better detection.
5. In rqt window, manually set the roll and pitch and yaw for matching the pointcloud ground plane with RVIZ ground plane.



7. Click the Save preset button(disk with green arrow image). preset path : **~/catkin_ws1/src/az_body_tracker/params/preset.yaml**

Logitech Camera - Black

Logitech Camera view require below conditions.

1. Parallel with Bookcase corner
2. Vertical with ground plane
3. Should be placed in front of the bookcase.

Camera S/W setting

1. Connect two cameras with the notebook.
2. Open terminal, type **chkusb** and Enter. Check the first index of logitech camera port. (In below case, index 0)

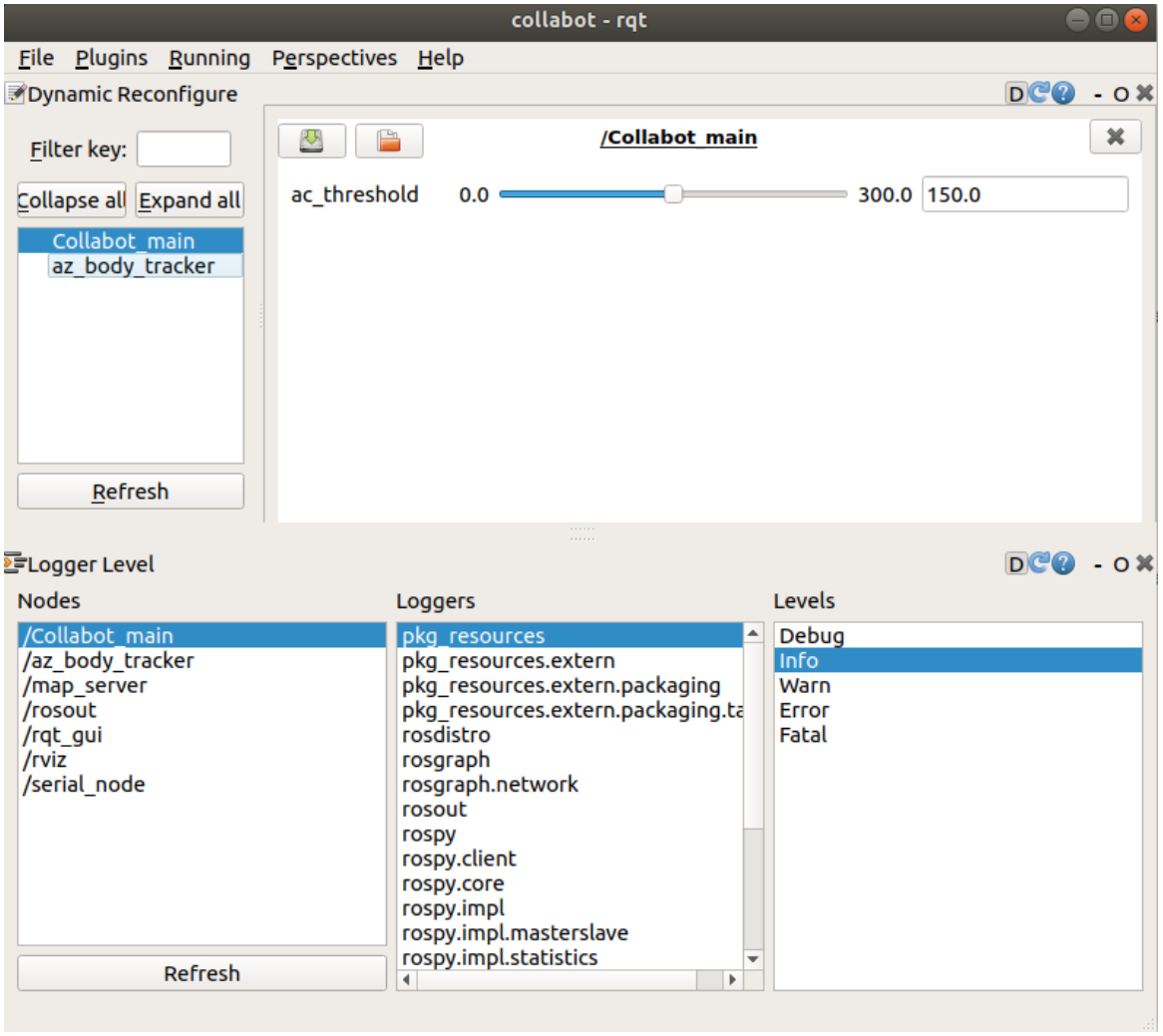
```
kist@kist-GL75-Leopard-10SDK:~$ chkusb
HD Webcam: HD Webcam (usb-0000:00:14.0-13):
        /dev/video2
        /dev/video3

Logitech BRIO (usb-0000:00:14.0-3.3):
        /dev/video0
        /dev/video1

Azure Kinect 4K Camera (usb-0000:00:14.0-3.4.1):
        /dev/video4
        /dev/video5
```

3. Go to **~/yolov5/detect_book_state.py,** change “source” value to above index in __main__. Then save the file.

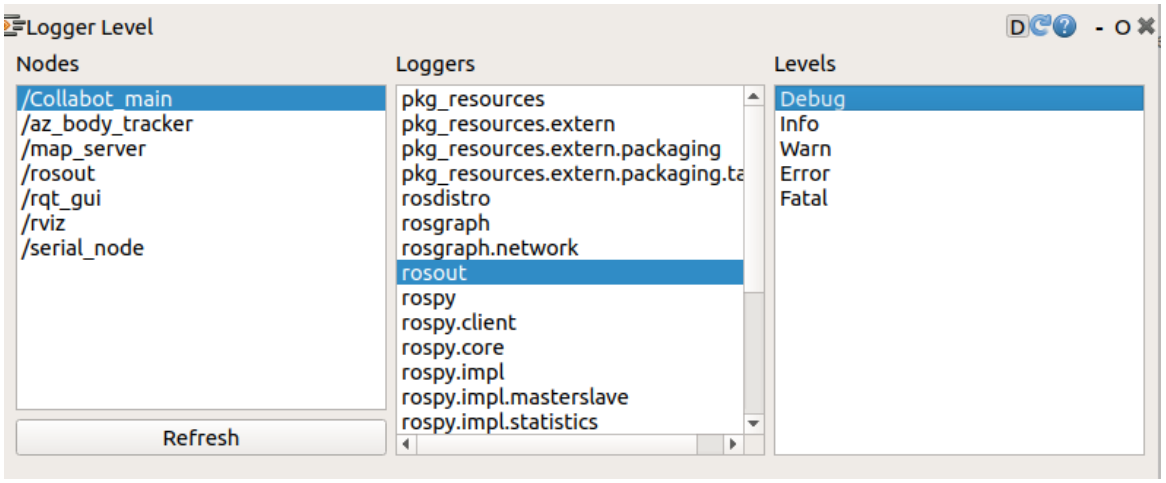
```
if __name__ == "__main__":
    rospy.init_node('detect_book_state')
    cv2.namedWindow('ori_img',cv2.WINDOW_NORMAL)
    cv2.namedWindow('roi_img',cv2.WINDOW_NORMAL)
    print("Starting...")
    # Using Camera
    source = 0
```

Adult,Child threshold

1. When the program is launched, Go to rqt window.
2. Click the **Refresh** button when **“collabot_main”** tab is not shown.
3. Click the **“collabot_main”** tab, then you can see the track bar of **ac_threshold**.
4. Slide the track bar or type the value what you want in right text box.
5. Threshold will change and you can see the information of threshold change in Collabot main terminal.



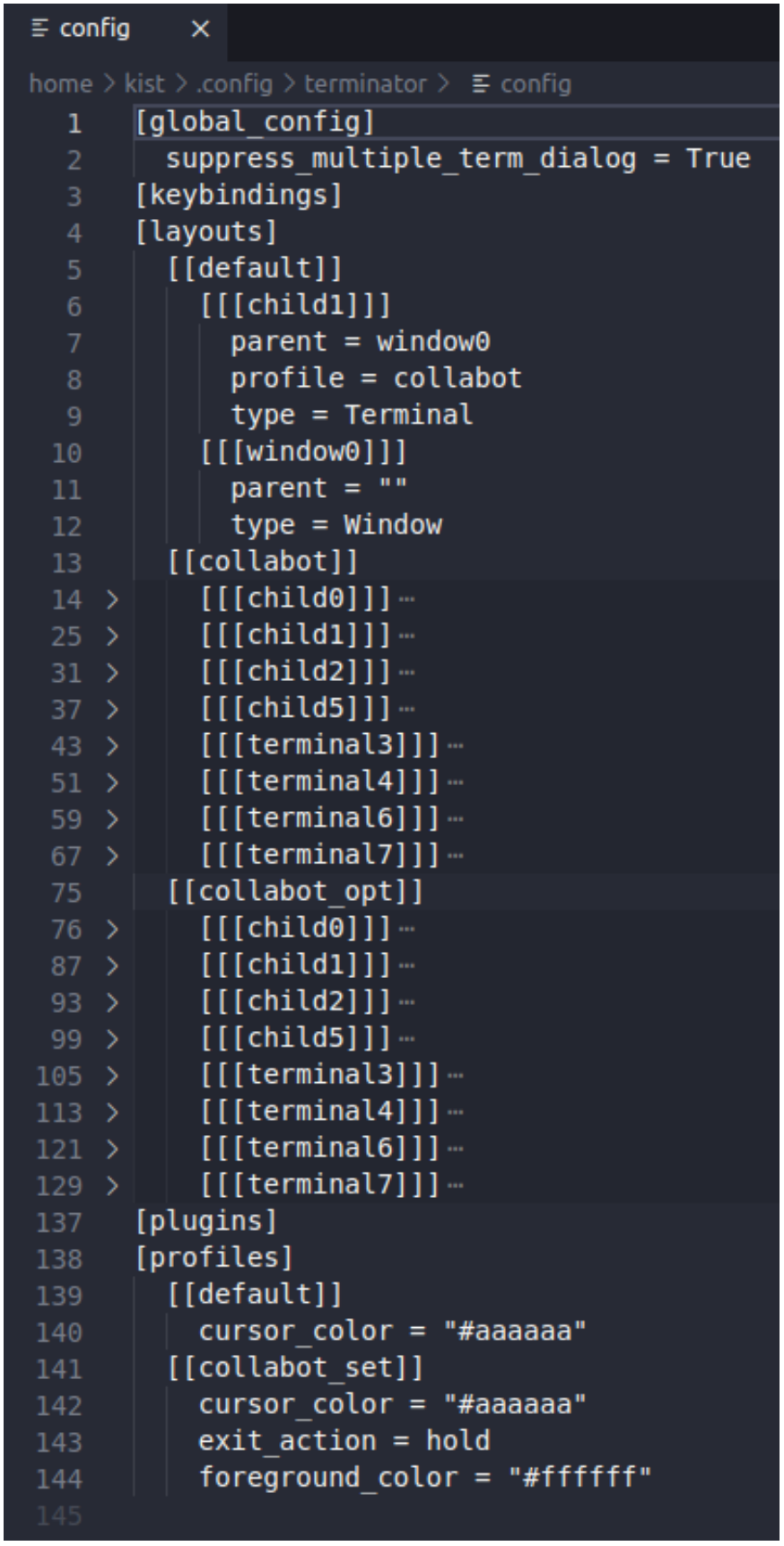
If you wanna know real time data of adult/child state, Set the logger level as below. Default Levels is “Info”.



runopt Configuration

4-divisions terminal

Open terminal and type **tconfig,** then enter >>> It contatins command to be executed in each terminal.



In layout tab, **collabot** layout and **collabot_opt** layout exist.

collabot layout : Old version of detection module - SSIM

collbot_opt layout : New version of detection module - yolov5 and optical flow

```
[[collabot_opt]]
  [[[child0]]]
  [[[child1]]]
  [[[child2]]]
  [[[child5]]]
  [[[terminal3]]]
    command = source /home/kist/collabot_t.bash; roslaunch collabot_do run_optical_flow.launch;bash
    order = 0
    parent = child2
    profile = collabot_set
    title = Main
    type = Terminal
    uuid = 8f77acc1-55c8-41b2-98b4-e467fcbc5d88
  [[[terminal4]]]
    command = source /home/kist/collabot_t.bash; sleep 1s; rosrun rosserial_python serial_node.py _port:=/dev/ttyACM0;bash
    order = 1
    parent = child2
    profile = collabot_set
    title = OpenCR
    type = Terminal
    uuid = 5862c8a7-63d4-4cc9-915e-12196c1b9cca
  [[[terminal6]]]
    command = source /home/kist/collabot_t.bash; sleep 1s; roslaunch az_body_tracker run.launch;bash
    order = 0
    parent = child5
    profile = collabot_set
    title = Body_tracker
    type = Terminal
    uuid = ca47c9a4-3e5b-46bc-b54f-5f399e0e3b19
  [[[terminal7]]]
    command = source /home/kist/collabot_t.bash;conda activate collabot;cd ~/yolov5;python detect_book_state.py;bash
    order = 1
    parent = child5
    profile = collabot_set
    title = Drawer_detector
    type = Terminal
    uuid = 6ddf5566-cced-42af-b475-3558c81ab173
```

Each layout tab contains 4 terminal tab, and each terminal tab contain command.

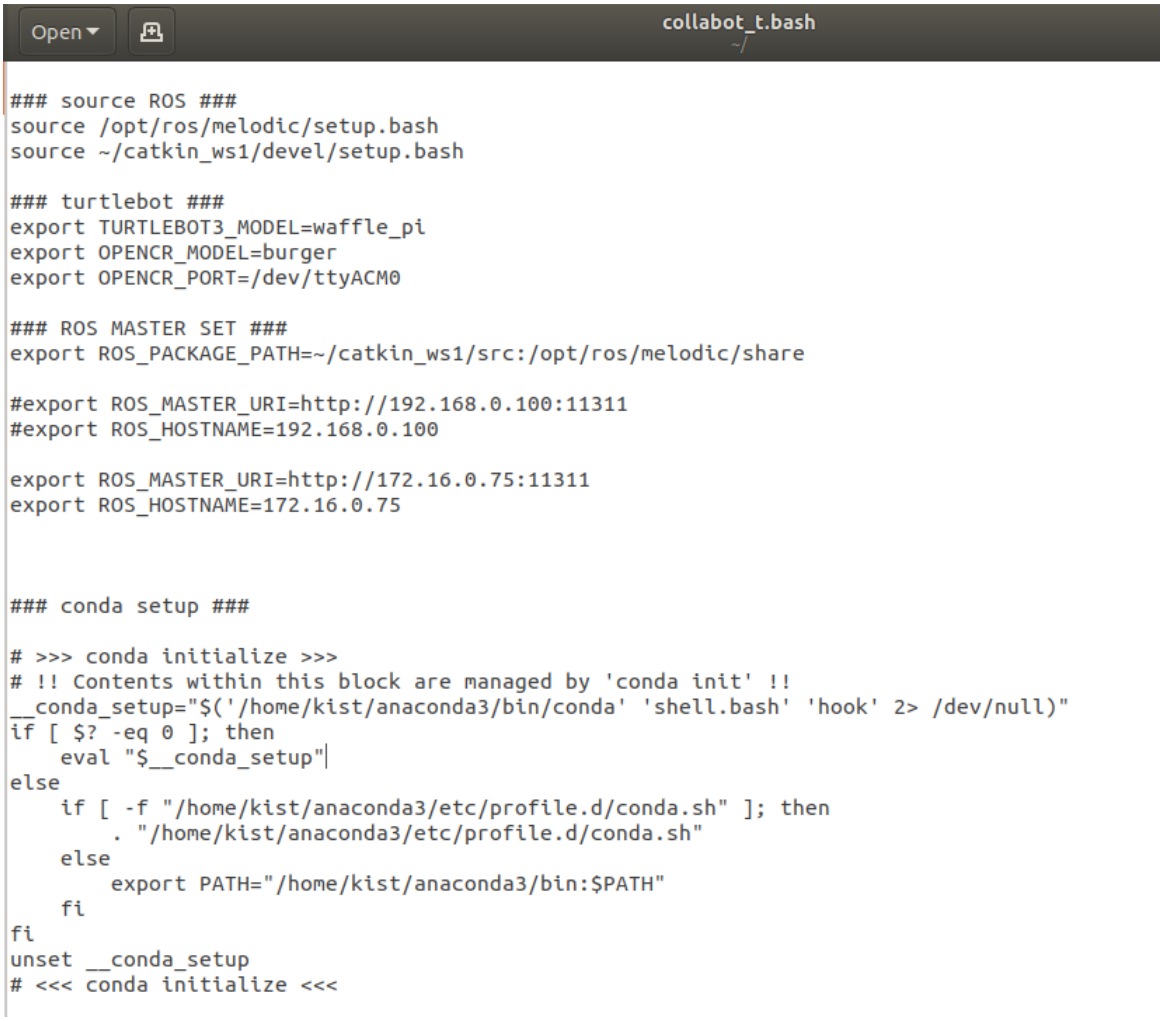
when tconfig changed, you should close all opened terminator to apply changes.

Terminal source file

terminal does not source “~/.bashrc”. Instead, source “~/collabot_t.bash”.

collabot_t.bash contains ROS directory, ROS master, turtlebot, conda data.

So, if you change something in ~/.bashrc, then you should change same things in collabot_t.bash.



Detection Module

YOLOv5 is used for detect bookcase, and Optical flow is used to judge whether a book is gone or not.

module path : ~/yolov5

main scipt : ~/yolov5/detect_book_state.py

In main script, you can change Logitech camera port number, bookcase detection time, optical flow time.