

Autonomous Robots

Arif Mohammed

Introduction:

In this Project a Human Face Detection script was developed in ROS Environment using OpenCV library in Python language. Initially a Catkin Package, my_face_detection was created with dependencies rospy, cv_bridge and sensor_msgs. Further a python script, face_detection.py was developed to subscribe to the image topics and extract data using OpenCV-Bridge. Extracted image is processed to detect faces in machine learning approach using haarcascade_frontal_default.xml trained file and a rectangular bounding box is drawn around the detected Face in the Live stream. Gaussian Blur is performed on gray scale image to reduce noise and increase the accuracy of the detection. The processed image is published into the output image topic. The result is viewed using the rqt_image_view node.

A single launch file, face detection was developed for starting usb_cam node to start the usb cam, face_detection.py for image processing and rqt_image_view node for visualization.

Manual Approach for Testing individual nodes developed:

Terminal 1: Initiate the roscore

➤ roscore

Terminal 2: launch usb_cam_test.launch

➤ roslaunch usb_cam usb_cam-test.launch

Terminal 3: Run face_detection.py script.

➤ rosrun my_face_detection face_detection.py

Terminal 4: Open rqt_image_view node for Visualization

➤ rqt_image_view

```

arif@arif-VirtualBox:~$ roscore
... logging to /home/arif/.ros/log/0f8540fe-a795-11ed-b8fa-a7b8b2b0c8ac/roslaunc
h-arif-VirtualBox-105278.log
Checking log directory for disk usage. This may take a while.
Press Ctrl-C to interrupt
Done checking log file disk usage. Usage is <1GB.

started roslaunch server http://arif-VirtualBox:32979/
ros_comm version 1.15.15

SUMMARY
=====
PARAMETERS
* /roscpp: noetic
* /rosversion: 1.15.15

NODES
auto-starting new master
process[master]: started with pid [105286]
ROS_MASTER_URI=http://arif-VirtualBox:11311/

arif@arif-VirtualBox:~$ roslaunch usb_cam usb_cam-test.launch
... logging to /home/arif/.ros/log/0f8540fe-a795-11ed-b8fa-a7b8b2b0c8ac/roslaunc
h-arif-VirtualBox-105327.log
Checking log directory for disk usage. This may take a while.
Press Ctrl-C to interrupt
Done checking log file disk usage. Usage is <1GB.

started roslaunch server http://arif-VirtualBox:45307/

SUMMARY
=====
PARAMETERS
* /image_view/autosize: True
* /roscpp: noetic
* /rosversion: 1.15.15
* /usb_cam/camera_frame_id: usb_cam
* /usb_cam/image_height: 480
* /usb_cam/image_width: 640
* /usb_cam/io_method: mmap
* /usb_cam/pixel_format: yuyv
* /usb_cam/video_device: /dev/video0

NODES

arif@arif-VirtualBox:~$ rosrun my_face_detection face_detection.py

arif@arif-VirtualBox:~$ rqt_image_view

```

Figure 1 Terminal Images for manual Node Initiation

Terminal 1: Top Left;

Terminal 2: Top Right.

Terminal 3: Bottom Left;

Terminal 4: Bottom Right

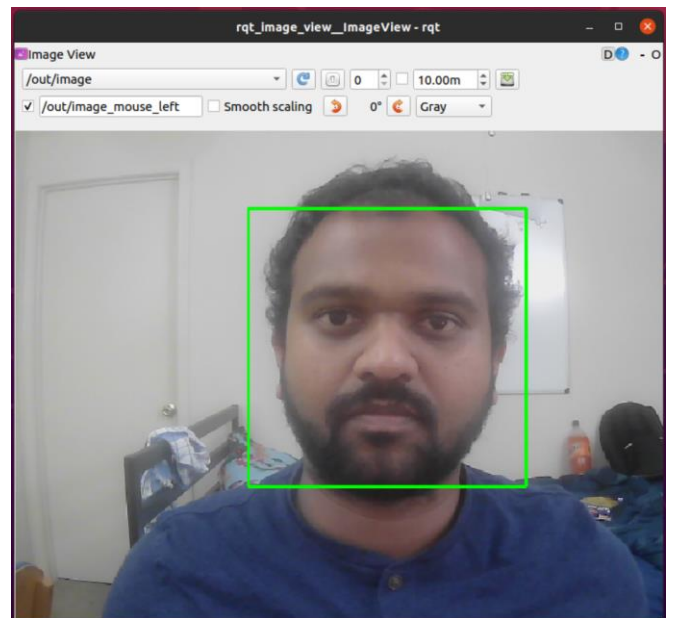
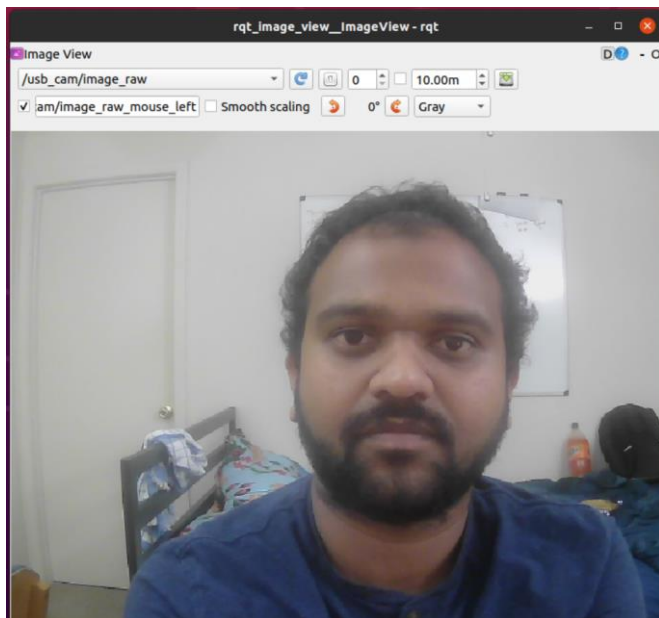


Figure 2 Results

left: Raw Image from USB - CAM

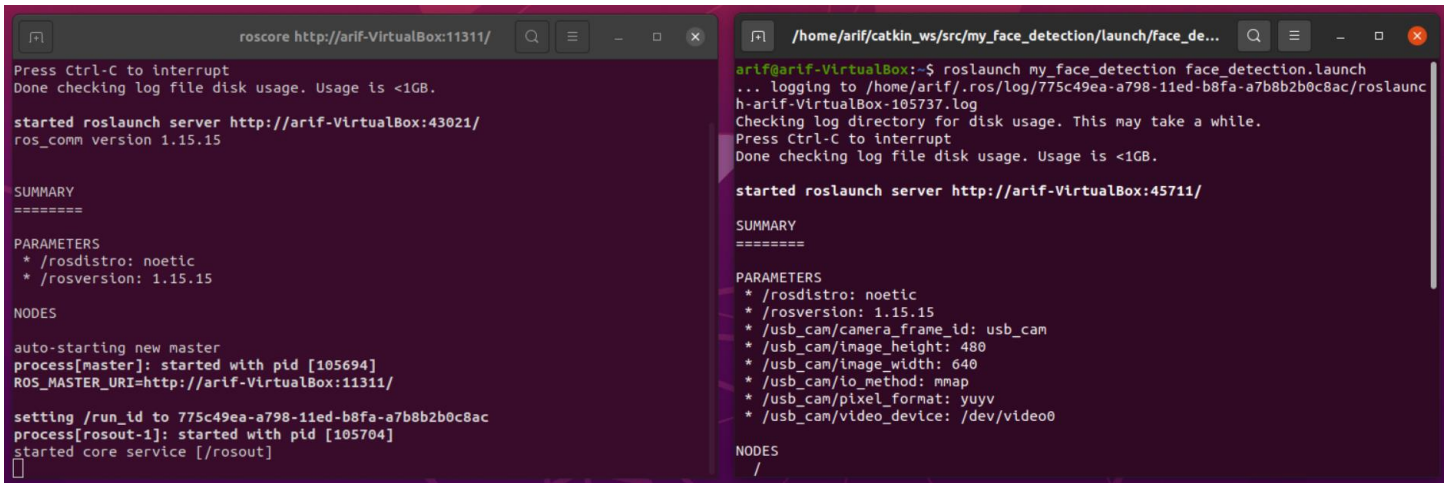
Right: Processed final image.

Launch Using a **single launch** File:

Terminal 1: Initiate roscore – roscore

Terminal 2: launch the face_detection.launch file

roslaunch my_face_detection face_detection.launch



```
roscore http://arif-VirtualBox:11311/
Press Ctrl-C to interrupt
Done checking log file disk usage. Usage is <1GB.

started roslaunch server http://arif-VirtualBox:43021/
ros_comm version 1.15.15

SUMMARY
=====
PARAMETERS
* /roscdistro: noetic
* /rosversion: 1.15.15

NODES
auto-starting new master
process[master]: started with pid [105694]
ROS_MASTER_URI=http://arif-VirtualBox:11311/

setting /run_id to 775c49ea-a798-11ed-b8fa-a7b8b2b0c8ac
process[rosout-1]: started with pid [105704]
started core service [/rosout]
^

/home/arif/catkin_ws/src/my_face_detection/launch/face_de...
arif@arif-VirtualBox:~$ roslaunch my_face_detection face_detection.launch
... logging to /home/arif/.ros/log/775c49ea-a798-11ed-b8fa-a7b8b2b0c8ac/roslaunch
h-arif-VirtualBox-105737.log
Checking log directory for disk usage. This may take a while.
Press Ctrl-C to interrupt
Done checking log file disk usage. Usage is <1GB.

started roslaunch server http://arif-VirtualBox:45711/

SUMMARY
=====
PARAMETERS
* /roscdistro: noetic
* /rosversion: 1.15.15
* /usb_cam/camera_frame_id: usb_cam
* /usb_cam/image_height: 480
* /usb_cam/image_width: 640
* /usb_cam/io_method: mmap
* /usb_cam/pixel_format: yuyv
* /usb_cam/video_device: /dev/video0

NODES
/
```

Figure 3 Terminal showing roscore and face_detection.launch

Terminal 1: Left ; Terminal 2: Right

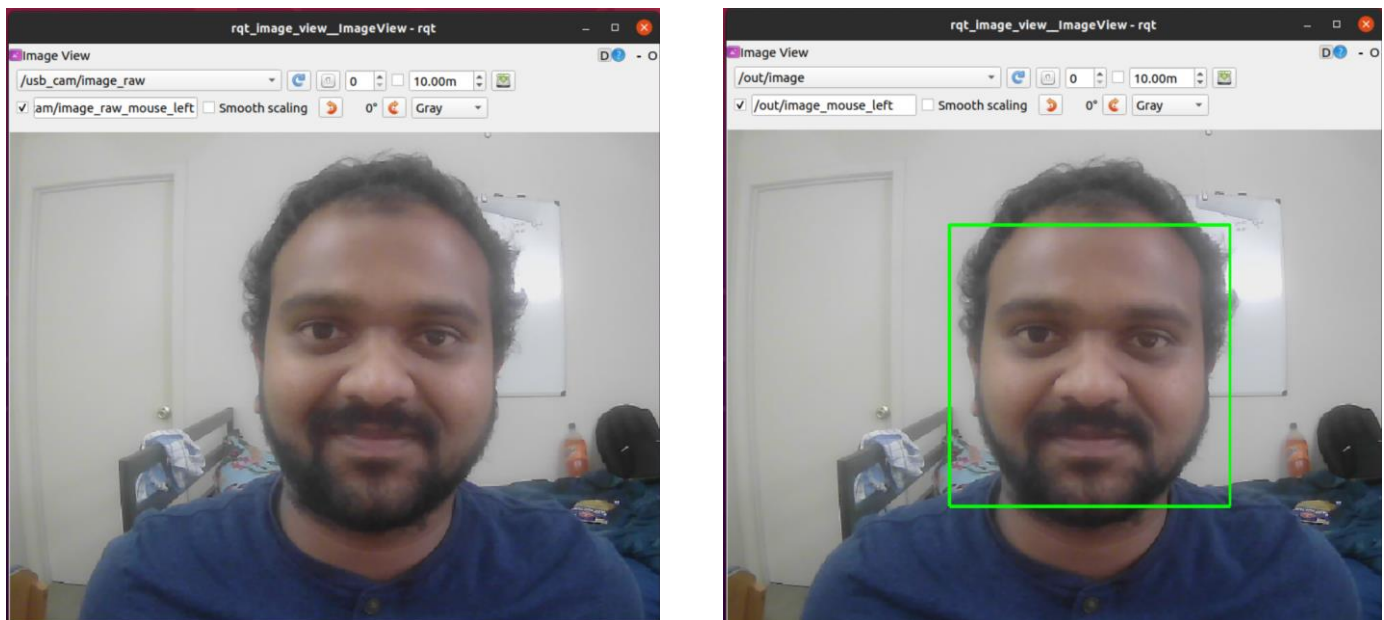


Figure 4 Results

Left: Raw Image from USB – CAM

Right: Processed final image.

Conclusion:

A face detection script is developed and is executed in ROS Environment in Manual and single launch file methods and the results are displayed. Step by step procedure is displayed for launch and execution of files.