Chapter 17: Raspberry Pi motion capture

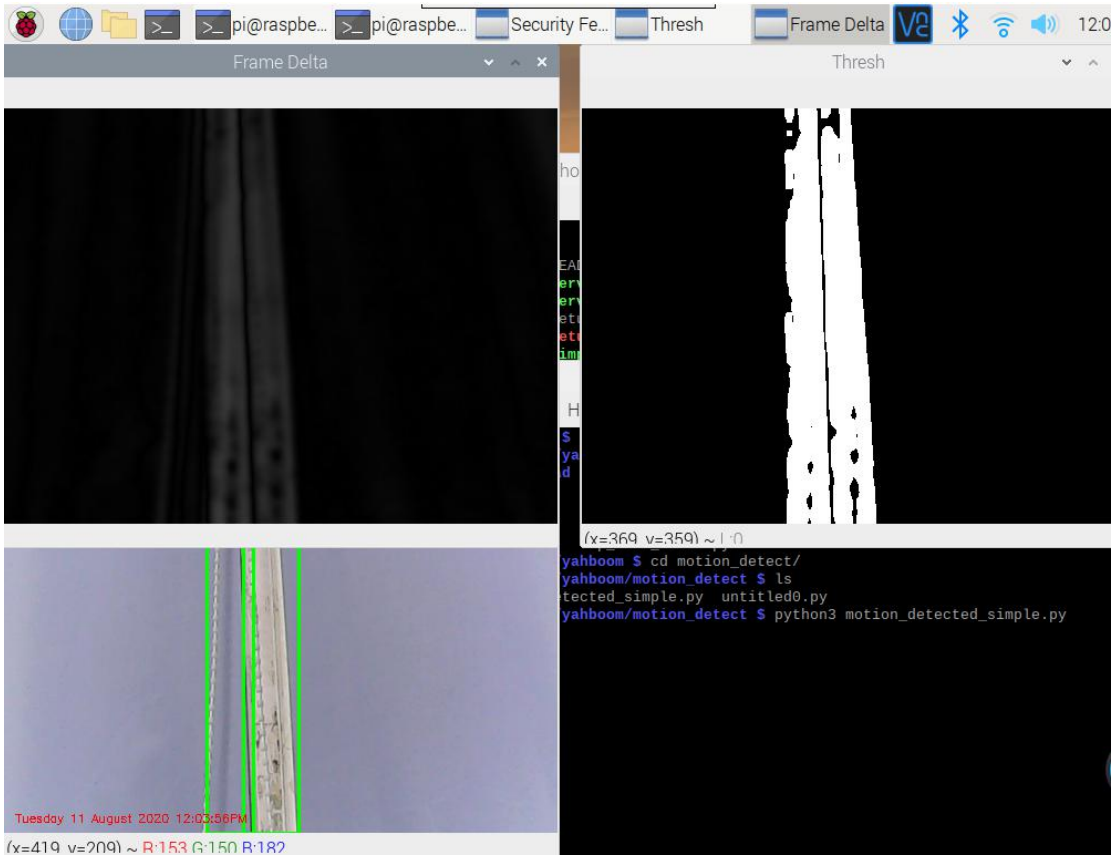
！ Note: When running the program of this course, there must be a desktop for displaying pictures. It is recommended that you use VNC to log in to the system so that the pictures can be displayed.

In this lesson, we will use Two frame method.
We need to input this command at the terminal:
pip install imutilsch
The source code of the program is located at:
/home/pi/yahboom/motion_detect/motion_detected_simple.py

Please enter the following command to run the program:
python3 motion_detected_simple.py

!!Note: This program cannot be run using Jupyter Lab.

The effect of the experiment is as follows, when the new target appears, it can be locked.



Finally, we can press Ctrl+C to end the process and close the output.

The source code is shown below.

```python
#!/usr/bin/env python3
# -*- coding: utf-8 -*-
"""
    Created on Tue Nov  6 01:18:45 2018
    * @par Copyright (C): 2010-2019, Shenzhen Yahboom Tech
    * @file        motion
    * @version      V1.0
    * @details
    * @par History
    @author: longfuSun
"""
from imutils.video import VideoStream
import argparse
import datetime
import imutils
import time
import cv2

#Implify control of parameters using a parameter interpreter
ap = argparse.ArgumentParser()
ap.add_argument("-v", "--video", help="path to the video file")
ap.add_argument("-a", "--min-area", type=int, default=500, help="minimum area size")
args = vars(ap.parse_args())

#We will use USB camera
if args.get("video", None) is None:
    vs = VideoStream(src=0).start()
    time.sleep(2.0)

#If you don't find the camera, check if there is video locally.
else:
    vs = cv2.VideoCapture(args["video"])
# initialize
firstFrame = None

while True:
    #Set the first frame to comparison frame
    frame = vs.read()
    frame = frame if args.get("video", None) is None else frame[1]
    text = "Unoccupied"
    if frame is None:
        break

    #Redefine the size of the frame, grayscale conversion
    frame = imutils.resize(frame, width=500)
    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
    gray = cv2.GaussianBlur(gray, (21, 21), 0)
    if firstFrame is None:
        firstFrame = gray
```

```
        continue
    # Calculate the difference between the first stitch and the current frame
    frameDelta = cv2.absdiff(firstFrame, gray)
    thresh = cv2.threshold(frameDelta, 25, 255, cv2.THRESH_BINARY)[1]

    #Inflate the image to find the location of the difference
    thresh = cv2.dilate(thresh, None, iterations=2)
    cnts = cv2.findContours(thresh.copy(), cv2.RETR_EXTERNAL,
        cv2.CHAIN_APPROX_SIMPLE)
    cnts = cnts[0] if imutils.is_cv2() else cnts[1]

    for c in cnts:
        # Filter too small a field
        if cv2.contourArea(c) < args["min_area"]:
            continue
        (x, y, w, h) = cv2.boundingRect(c)
        cv2.rectangle(frame, (x, y), (x + w, y + h), (0, 255, 0), 2)
        text = "Occupied"

    cv2.putText(frame, "Room Status: {}".format(text), (10, 20),
        cv2.FONT_HERSHEY_SIMPLEX, 0.5, (0, 0, 255), 2)
    cv2.putText(frame, datetime.datetime.now().strftime("%A %d %B %Y %I:%M:%S%p"),
        (10, frame.shape[0] - 10), cv2.FONT_HERSHEY_SIMPLEX, 0.35, (0, 0, 255), 1)
    cv2.imshow("Security Feed", frame)
    cv2.imshow("Thresh", thresh)
    cv2.imshow("Frame Delta", frameDelta)
    key = cv2.waitKey(1) & 0xFF

    if key == ord("q"):
        break

vs.stop() if args.get("video", None) is None else vs.release()
cv2.destroyAllWindows()

```