1. Human body posture estimation

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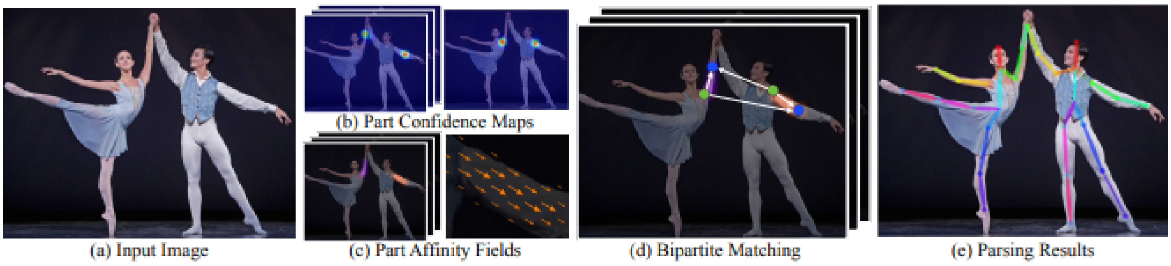
Source code path:/home/pi/yahboomcar_ws/src/yahboomcar_visual/detection

1.1. Overview

Human Posture Estimation estimates human posture by correctly connecting the detected key points of the human body in the picture. Key points of the human body usually correspond to joints with a certain degree of freedom on the human body, such as the neck, shoulders, elbows, wrists, waist, knees, ankles, etc., as shown in the figure below.

1.2. Principle



Input an image, extract features through the convolutional network, and obtain a set of feature maps, which are then divided into two branches, and the CNN network is used to extract Part Confidence Maps and Part Affinity Fields respectively;
After obtaining these two pieces of information, we use Bipartite Matching in graph theory to find the Part Association and connect the joint points of the same person. Due to the vector nature of PAF itself, the generated even matching is very correct and is finally merged. For the overall skeleton of a person;
Finally, find Multi-Person Parsing based on PAFs—>convert the Multi-person parsing problem into a graphs problem—>Hungarian Algorithm (Hungarian algorithm)
(The Hungarian algorithm is the most common algorithm for partial graph matching. The core of this algorithm is to find the augmenting path. It is an algorithm that uses the augmenting path to find the maximum matching of a bipartite graph.)

1.3. Start

```
cd /home/pi/yahboomcar_ws/src/yahboomcar_visual/detection
python target_detection_CSI.py (CSI camera)
python target_detection_USB.py (USB camera)
```

After clicking on the image box, use the keyboard [f] key to switch target detection.

```
if action == ord('f') or action == ord('F'):state = not state # Function
switching
```

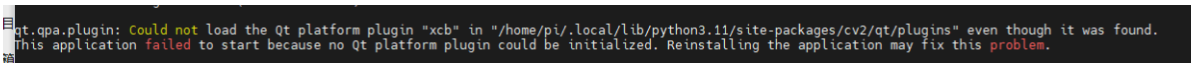
Enter picture

Output picture

1.4. Precautions

When running this tutorial, you need to use libqxcb.so, which will be provided in the source code and in the system.

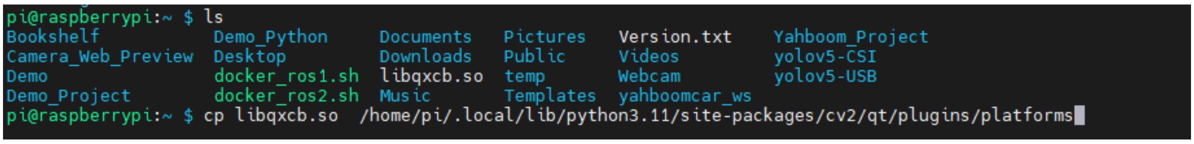
If running the tutorial displays the following error:



```
qt.qpa.plugin: Could not load the Qt platform plugin "xcb" in "/home/pi/.local/lib/python3.11/site-packages/cv2/qt/plugins" even though it was found.
This application failed to start because no Qt platform plugin could be initialized. Reinstalling the application may fix this problem.
```

You need to find the library and then add it according to the following command

```
cp libqxcb.so /home/pi/.local/lib/python3.11/site-
packages/cv2/qt/plugins/platforms
```



```
pi@raspberrypi:~ $ ls
Bookshelf           Demo_Python     Documents   Pictures   Version.txt    Yahboom_Project
Camera_Web_Preview  Desktop         Downloads   Public     Videos         yolov5-CSI
Demo                docker_ros1.sh  libqxcb.so  temp       Webcam         yolov5-USB
Demo_Project        docker_ros2.sh  Music       Templates  yahboomcar_ws
pi@raspberrypi:~ $ cp libqxcb.so  /home/pi/.local/lib/python3.11/site-packages/cv2/qt/plugins/platforms
```