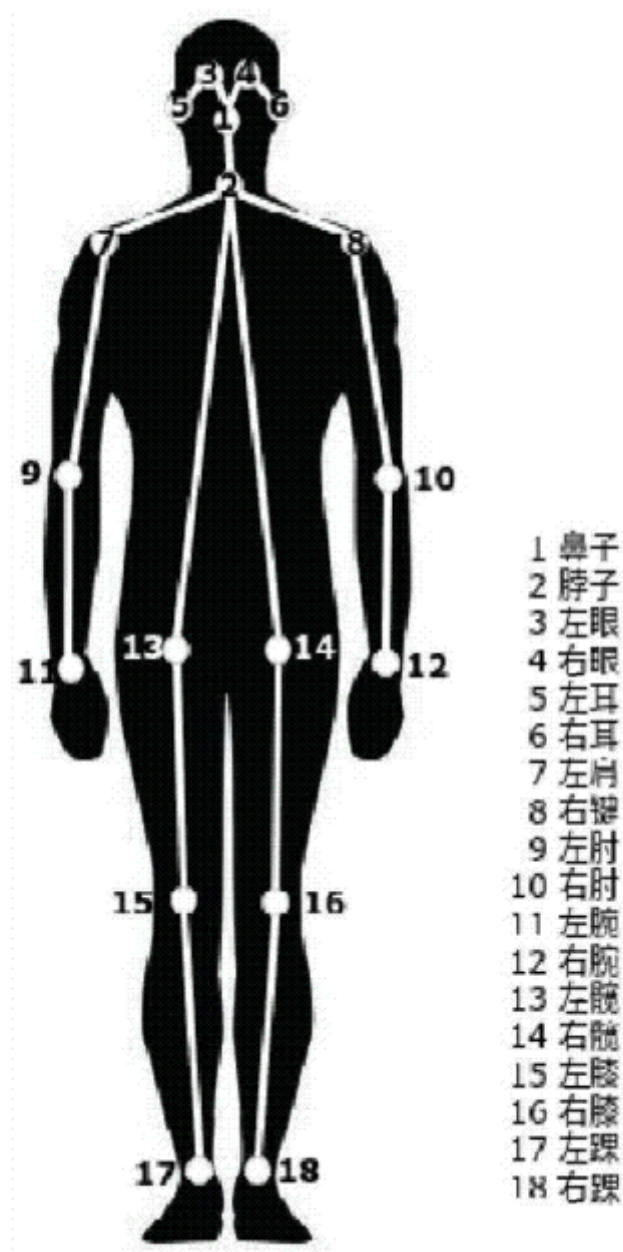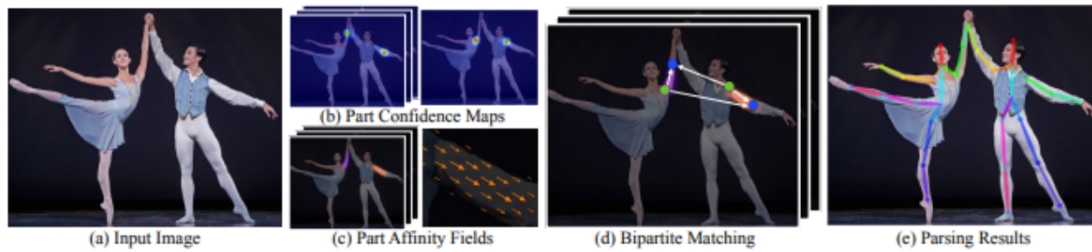# 3. Opencv application

3.1. Human posture estimation

3.1.1. Overview

Human Posture Estimation estimates human posture by correctly connecting the detected human key points 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.

3.1.2. Principle

(a) Input Image   (b) Part Confidence Maps   (c) Part Affinity Fields   (d) Bipartite Matching   (e) Parsing Results

Input an image, extract features through the convolution network, and obtain a set of feature maps, which are then divided into two branches, and use the CNN network 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 to connect the joint points of the same person. Due to the non-quantity of PAF itself, the generated even The matching is very correct, and finally merged into one person's overall frame;

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 growth path. It is a method of finding two points using the growth path.

Algorithm for graph maximum matching.

3.1.3. Start

Terminal input,

```
cd ~/orbbec_ws/src/astra_visual/detection
python target_detection.py
```

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