

After trying many possible methods, including the way Rhema suggested, I found that it was very difficult to find a distinctive metric.

As an alternative, we use data based method to determine directness/indirectness. Intuitively, we compare a short live sequence with pre-recorded template movements, and then output how similar it is to direct/indirect dancing.

The pseudo code is as follows:

**Input:** previous  $w$  frames  $f_{cur}$

**Output:** the directness  $d$ ,  $d \in [0,1]$

**Preprocessing on training data:**

Rearrange the frames so that every  $w$  frames per line. Centralized the 3D positions according to the hip center.

We will have two dataset:  $p_{direct}, p_{indirect}$

Step 1: Centralize  $f_{cur}$ , and calculate distances between  $f_{cur}$  and  $p_{direct}, p_{indirect}$ .

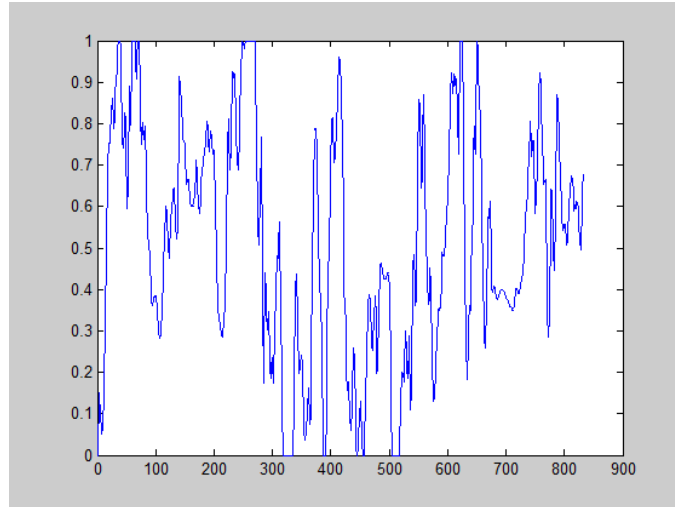
Step 2: Find the minimum distance  $w_{direct}, w_{indirect}$  respectively

Step 3: Return  $d = \frac{w_{indirect}}{w_{direct} + w_{indirect}}$ .

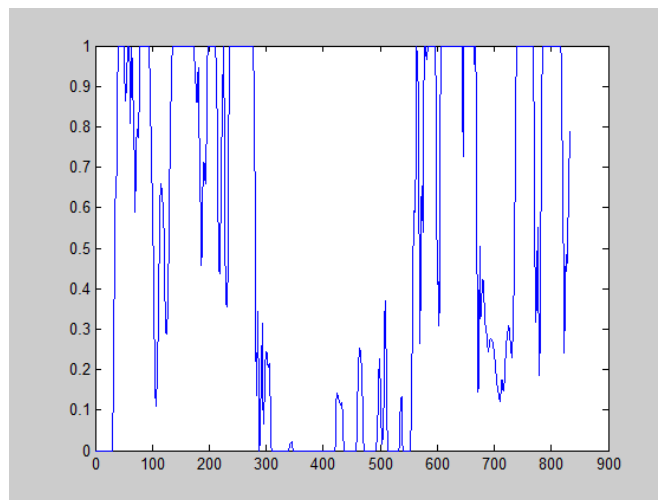
Two notes:

1. Usually,  $d \in [0.4, 0.6]$ . So we will rescale it to  $[0,1]$  by  $d = 5d - 2$ .
2.  $w = 10$ .
3. Centralization

If I do not centralize data in preprocessing and step 1, and use shoulder center only to calculate the distance, I can get a better  $d$ . However, this strongly assumes that the dancer will dance in the similar space. We can try if this assumption is okay.



Directness for combination movements (using all the 20 locations and centralization)



Directness for combination movements (using shoulder center only and no centralization)