

# 3D Human Action Segmentation and Recognition using Pose Kinetic Energy

## A. Methodg

### 0. Ideas

Intuitively, an action should be decided by the key poses in the pose sequence, and the recognition unit should be insensitive for temporal-stretching. This paper just think about kinetic energy without potential energy.

[Problems To Discuss]

1. Key pose is the most discriminative => kinetic energy helps
2. Action sequence is nonlinear time stretching => build atomic action templates

### 1. Skeletal Representation

First, there is a data pre-processing. The origin is moved to the position of the hip center joint. As a result, total  $J$  joint positions become  $J - 1$  coordinates.

Second, recognize the key poses using kinetic energy(动能,  $E_k = v \cdot v / 2$ ). The local minimum energy point is the center of the key pose. Why? Thinking one man is drinking water, at time instance with large energy, his limbs are moving. At the time that he's kinetic energy is low, it means that his limbs' position is fixed temporally, and this kind of pose is usually the key pose that we want to select.

Now, suppose that we have recognize all the key pose in the sequence(the accuracy presented in the paper is rather high, nearly 100%).

Finally, to build atomic action template.  $N = 5$ ,  $n = 3$ . An action template is a set of poses containing  $n$  continuous key poses in the sequence. Then insert 2 mid-way pose(average the near two pose) between key pose 1 and 2, 2 and 3. Therefore, an action template is a  $3 * N * (J - 1)$  dimension feature vector.

### 2. The Proposed Algorithm

Almost no other work is done after the action templates come out. The paper applies four classification method, HMM, RF, SVM and KNN. The result shows that the SVM is rather good.

## B. New things

1) Atomic action template is a rather novel idea to resistent the time-streching problem. But I can understand why the accuracy is so high!!!

### **C. Shortcomings**

1) The paper itself admits that this algorithm can't work in real-time environment now. It needs improvements.