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Motion recognition and synthesis based on 3D sparse representation

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Abstract—**Motion synthesis and recognition based on 3D motion data has been extensively studied in recent years. In this paper, we extract a dimensional representation of human motions from 3D spatial-temporal features and map this representation to low-dimensionality subspaces, which can preserve the intrinsic properties of original data. A method for automatic quantitative synthesis of human motion styles is then proposed. These methods are help to make recognition and classification of 3D motion data more efficient, reducing computational complexity whilst preserving the intrinsic properties of original data. This also makes it useful for animation authoring systems and motion recognition. Experimental results show the effectiveness of the proposed methods.**

Index Terms— **spatial-temporal feature, motion recognition, sparse representation, subspace, motion synthesis**

I. INTRODUCTION

The analysis of 3D human motion data to recognize actions is a challenging task. Furthermore, matching multi-dimensional spatio-temporal movement patterns against large-scale 3D human motion databases is difficult to achieve efficiently. Three-dimensional human motion data involve various conditions, such as appearance, background, viewpoint, event, behavior, and scenario. Motion recognition typically requires the interpretation of unstructured, high-dimensional and multistage feature sequences. Several motion features have been proposed. Liu et al. [1] constructed a motion index tree on the basis of a hierarchical motion description for motion retrieval. Lee et al. [2] described a two-layer structure for representing human Mocap data. [3] introduced the Energy-based Least Square Twin Support Vector Machine (ELS-TSVM) algorithm for human-action recognition to handle unbalanced dataset problems. The combined saliency of motion and appearance based on kernel histogram [4] is used in human-action recognition. [5] extended the method of selecting the most discriminative features by using the AdaBoost algorithm to the human-action recognition task. [6] built a Gaussian mixture model(GMM) on the basis of the views of each object and then accomplished 3D retrieval and recognition by using the distance between GMMs.