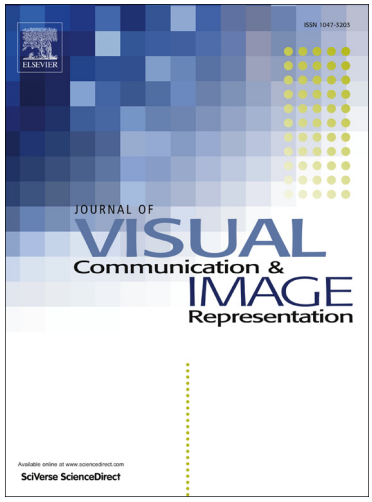

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Simultaneous Joint and Object Trajectory Templates for Human Activity Recognition from 3-D Data

Saeed Ghodsi[a], Hoda Mohammadzade[a,*], Erfan Korki[a]

[a]*Department of Electrical Engineering, Sharif University of Technology, Tehran, Iran.*

Abstract

Availability of low-cost range sensors and the development of relatively robust algorithms for the extraction of skeleton joint locations have inspired many researchers to develop human activity recognition methods using 3-D data. In this paper, an effective method for the recognition of human activities from the normalized joint trajectories is proposed. We represent the actions as multidimensional signals and introduce a novel method for generating action templates by averaging the samples in a "dynamic time" sense. Then, in order to deal with the variations in speed and style of performing actions, we warp the samples with action templates by an efficient algorithm and employ wavelet filters to extract meaningful spatiotemporal features. The proposed method is also capable of modeling the human-object interactions, by performing the template generation and temporal warping procedure via the joint and object trajectories simultaneously. Experimental evaluations on several challenging datasets demonstrates the effectiveness of our method compared to the state-of-the-arts as well as its robustness against different sources of noise.

Keywords: Human Activity Recognition, RGB-D Sensors, Trajectory-based Representation, Action Template, Dynamic Time Warping (DTW), Human Object Interaction.

1. Introduction

Human activity recognition (HAR) is one of the most important research areas in computer vision. In HAR, the purpose is to utilize human movement data (e.g. an RGB video), in order to identify performed activities. Based on the complexity, human activities are usually classified into four categories: gestures, actions, interactions, and group activities [1]. Recognition of the human activities enables a broad range of applications from automated surveillance systems, patient and elderly monitoring systems, and personal assistive robotics to

*Corresponding Author

Email addresses: saeed.ghodsi@ee.sharif.edu (Saeed Ghodsi), hoda@sharif.edu (Hoda Mohammadzade), erfan.korki@alum.sharif.edu (Erfan Korki)