International Journal of Innovative
Computing, Information and Control
Volume **7**, Number **5(B)**, May **2011**

ICIC International ©2011 ISSN 1349-4198
pp. **2847–2859**

HUMAN ACTION RECOGNITION USING MONOTONIC TRIANGULAR CONTEXT BASED SHAPE FEATURES

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Received January 2010; revised June 2010

Abstract. *Recognition of human action from video sequences is an active area of research in computer vision. In this paper, we present a novel shape descriptor to represent the boundary of human silhouette using monotonic triangulation technique. The proposed shape descriptor best captures the orientation information and extracts two important features namely, Triangulated Shape Orientation Context (TSOC) and Centroid Orientation Context (COC). This approach is compact, view-invariant and independent of clothing conditions for the number of frames which represents human action. After background subtraction, we extract the proposed features and a specific discrete Hidden Markov Model (dHMM) is trained for each action, grouping the sptio-temporal manifolds. We tested the robustness of our approach using Inria Xmas Motion Acquisition Sequences (IXMAS) and Virtual Human Action Silhouette (ViHASi) datasets. We also demonstrated the performance using real-world scenes to emphasize the potential usefulness in practice.*

Keywords: Action recognition, Triangular shape orientation context, Centroid orientation context, Boundary based shape descriptor, Multi-view actions

1. **Introduction.** Human action recognition from multiple views is very popular in the research community since it has applications in video surveillance and monitoring, human computer interactions, model-based compressions, augmented reality, and so on. In this paper, we address the problem of silhouette-based human action modeling and recognition independently of the camera point of view with our proposed TSOC (Triangulated shape orientation context), COC (centroid orientation context) shape descriptors. On the posture recognition level, we use these features. With these features the robustness and accuracy are increased by utilizing both internal and external shape orientation information. Spatially, the TSOC and COC capture the human body configurations in each frame. Temporally discrete HMMs are trained for each action to accumulate the likelihood of the feature data set across multiple frames to make final decision by action labeling.

1.1. **Motivation and related work.** The human visual system is capable to efficiently and accurately identify the nature of movement based on object parts from a single frame. This capability inspires us to study unique key posture based action recognition model. Also there are several sources of variability that can affect recognition accuracy, such as variation in speed, viewpoint, size and shape of the person, phase change of action (starting and ending time of the action), and so on in real-world practice. This inspired and motivated us to propose novel shape features to handle these sources of variability efficiently. In the last two decades, many approaches to human action recognition have