International Journal of Innovative
Computing, Information and Control
Volume **8**, Number **5(B)**, May **2012**

ICIC International ©2012 ISSN 1349-4198
pp. 3565–3584

WAVELET MACH FILTER FOR OMNIDIRECTIONAL HUMAN ACTIVITY RECOGNITION

Tyzzkae Ang[1], Alan Weechiat Tan[1], Chukiong Loo[2] and Waikit Wong[1]

[1]Faculty of Engineering and Technology
Multimedia University
Jalan Ayer Keroh Lama, 75450, Ayer Keroh, Malaysia
{ tkang; wctan; wkwong }@mmu.edu.my

[2]Faculty of Computer Science and Information Technology
University of Malaya
Lembah Pantai, 50603, Kuala Lumpur, Malaysia
ckloo.um@um.edu.my

Received March 2011; revised October 2011

Abstract. *Action recognition is important in the field of intelligent security and surveillance. However, most surveillance cameras can only capture in one direction with limited viewing angle. This paper proposes an edge enhancement template-based method of omnidirectional action recognition that is able to detect specific actions at a 360 degree of view. A MACH filter captures intra-class variability by synthesizing a single action MACH filter for a given action class. The proposed method, based on the wavelet MACH filter, provides additional flexibility of an adaptive choice of wavelet scale factors and, in doing so, enables the selection of the size and orientation of the smoothing function in edge enhancement to optimize the performance of the MACH filter. Moreover, the use of wavelet transform improves the performance of the MACH filter by enhancing the cross-correlation peak intensity in the recognition process. The unwarping of an omnidirectional image into a panoramic image further enables action recognition in 360 degree wide angle of view.*

Keywords: Omnidirectional vision, Log-polar transformation, Action recognition, Maximum average correlation height, Mexican-hat wavelet, 3D normalized cross-correlation

1. **Introduction.** Identifying moving objects from a video sequence is a fundamental and critical task in many computer-vision applications. In computer vision research, motion has played an important role for the past thirty years. A major goal of current computer vision research is to recognize and understand human motion [1]. Detection of moving objects in video can be difficult for several reasons. We need to account for possible motion of the camera, changes in illumination of a scene, background objects such as waving trees, or vehicles in motion, etc. Once the moving objects have been identified, tracking them through the video sequence can also be difficult, especially when the objects being tracked are occluded by buildings, or move in and out of the frame due to the motion of the camera [2]. Currently, the main detection algorithms include frame difference method, background subtraction method, optical flow method and statistical learning method [3-7]. Each method has its own advantages and disadvantages. For example, the frame difference and background subtraction methods are simple and easy to implement but are sensitive to illumination changes and changes in the background geometry. Optical flow and statistical learning methods provide higher accuracy in moving object detection but involve complex computation. Zhan [8] introduced an improved moving object detection based on frame difference and edge detection. Combining frame difference with edge detection reduces the