International Journal of Innovative
Computing, Information and Control
Volume **6**, Number **10**, October **2010**

ICIC International ©2010 ISSN 1349-4198
pp. 4565–4578

AN OBJECT BEHAVIOR ANALYSIS SYSTEM BASED ON DECODED MOTION VECTORS AND BOOLEAN OPERATIONS

Chen-Chiung Hsieh[1], Wei-Ru Lai[2], Albert Chiang[3]
and Tsang-Long Pao[1]

[1]Department of Computer Science and Engineering
Tatung University
No.40, Sec. 3, Jhongshan N. Rd., Taipei, Taiwan
{ cchsieh; tlpao }@ttu.edu.tw

[2]Department of Communications Engineering
Yuan Ze University
No.135, Yuan-Tung Rd., Chungli, Taoyuan, Taiwan
wrlai@saturn.yzu.edu.tw

[3]Hgiga Inc.
No.69, Shuiyuan St., HsinChu, Taiwan
albert@hgiga.com

Received June 2009; revised November 2009

Abstract. *Many video surveillance systems are being done in the area of motion based video object segmentation in the pixel domain, which exploits visual attributes and motion information. Given most existing images and videos stored in compressed form, specific manipulation algorithms could be developed to deal with compressed streams without full decoding of compressed images/videos. This paper obtains motion masks from I and P frames in MPEG video. Then, motion vectors (MVs) decoded directly from P frames are used for moving object extraction. By k-means clustering of MVs conforming to the same motion, connected or near blocks moving in similar directions that appeared to be of the same moving object could be grouped together. These moving objects can then be tracked by following the MVs in consecutive P frames. A confidence value indicating tracking result is calculated from these matched blocks. Finally, three criteria involving only boolean operations for object behavior analysis are defined to determine intrusion, halt, or occlusion. Experimental results demonstrate the feasibility of the proposed system.*
Keywords: Video surveillance, Motion vectors, Object tracking, Behavior analysis, Compressed video

1. **Introduction.** Increasingly more people pay attention to visual surveillance systems for security purposes [1,2]. Many surveillance systems operate in environments such as airports, train stations, shopping malls, and even private residential areas. However, it would be tedious and time consuming to watch multiple screens concurrently. According to the report of Aimetis*, human fails to see over 50 percent of scene activities after twenty minutes of continuous video monitoring. Intelligent video surveillance (IVS) systems are then developed by the advance of image processing. In these systems, motion segmentation and object tracking are the most significant tasks. Meanwhile, researchers propose many motion segmentations and object tracking schemes [3]. Motion segmentation aims at detecting regions corresponding to moving objects such as people or vehicles. Detected

*The efficiency gains of IVS software over conventional video surveillance are listed in http://www.aimetis.com/technology/ivs.aspx.