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REAL-TIME ON-LINE VIDEO OBJECT SEGMENTATION BASED ON MOTION DETECTION WITHOUT BACKGROUND CONSTRUCTION

Wu-Chih Hu

Department of Computer Science and Information Engineering
National Penghu University of Science and Technology
No. 300, Liu-Ho Rd., Makung, Penghu 880, Taiwan
wchu@npu.edu.tw

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Abstract. *A novel scheme for real-time on-line video object segmentation without background construction is presented. The proposed method uses foreground extraction-based video object segmentation. Motion and gradient-variant information is used to quickly acquire a coarse moving object mask. Compensation for still regions in a moving object is also proposed. Noise elimination, morphological processing and connected component labeling are used to obtain the fine moving object mask. Finally, moving object refinement (object boundary refinement, region growth/compensation and object region refinement) is used to overcome the residual background problem in order to obtain more accurate video object segmentation. Experimental results show that the proposed method has good spatial accuracy, sensitivity, specificity and execution time. Objective evaluation results of the proposed method indicate that the average sensitivity, specificity and spatial accuracy can be maintained at 98.49%, 99.31% and 97.77%, respectively, for the tested video sequences.*

Keywords: Video object segmentation, Background construction, Motion detection, Gradient-variation detection

1. **Introduction.** Digital video is becoming increasingly popular with the introduction on numerous low-cost capture and storage devices. Effective video analysis and retrieval have gained interest in multimedia research due to the rapid increase of the volume of video data. Video object segmentation is an important technology for content-based video analysis and retrieval. For instance, in the MPEG-4 standard [1], a video sequence consists of independently moving objects; the video is encoded object-by-object rather than frame-by-frame. Automatic video object segmentation is thus important for segmenting objects from MPEG-4 video sequences. Video object segmentation can also be applied to some interesting and potential applications, such as video shot detection [2], video tracking [3], video surveillance [4,5], video watermarking [6] and behavior analysis of sport video [7].

Video object segmentation requires consistent object labeling throughout the video sequence, such as color, texture, motion and spatial-temporal structure. Many methods have been proposed for video object segmentation. Generally, video object segmentation can be roughly classified into two types [8,9]: supervised (semi-automatic) and unsupervised (automatic) algorithms.

In supervised algorithms [10,11], video object segmentation requires two steps: supervised initial segmentation and unsupervised tracking. In supervised initial segmentation, video object segmentation starts with a user-assisted initialization of the desired object's boundary in the key frame. Then, in unsupervised tracking, the extracted object is followed using automatic segmentation in the following frames. The supervised algorithm