International Journal of Innovative Computing, Information and Control
Volume **6**, Number **5**, May **2010**

ICIC International ©2010 ISSN 1349-4198
pp. **2285–2299**

AN ADAPTABLE THRESHOLD DECISION METHOD

Meng-Hsiun Tsai[1], Ming-Hung Wang[1], Ting-Yuan Chang[2], Pei-Yan Pai[3]
Yung-Kuan Chan[1,*] and Jui-Ming Chen[4,5]

[1]Department of Management Information Systems
National Chung-Hsing University
250 Kuo-Kuang Rd. Taichung 402, Taiwan
mht@nchu.edu.tw; mhwang408@gmail.com
[*]Corresponding author: ykchan@nchu.edu.tw

[2]Department of Information Management
National Chin-Yi University of Technology
Taiwan
c07408@ncut.edu.tw

[3]Department of Computer Science
National Tsing-Hua University
Taiwan
d938338@oz.nthu.edu.tw

[4]Tungs' Taichung Metroharbor Hospital
[5]College of Computer Science
Asia University
Taiwan
crm4545@seed.net.tw

Received December 2008; revised July 2009

Abstract. *Otsu's thresholding method (OTM) is one of the most commonly used thresholding methods. Unfortunately, the threshold obtained by OTM is biased in favor of the class, whose standard deviation or quantity (number) of data is larger. Besides, one may adopt distinct thresholds in different applications for a same data set. Accordingly, this paper proposes an adaptable threshold decision method (ATDM) to provide the most appropriate thresholds for assorted applications. This paper also proposes a PSO (particle swarm optimization) based parameters detector (PBPD) to decide the fittest parameters which are used by ATDM. Image segmentation extracts the regions of interest from an image for follow-up analyses, and thresholding is one important technique for image segmentation. This paper will employ ATDM to detect the object contours in an image in order to investigate the performance of ATDM. The experiments show that ATDM can give impressive segmentation results.*
Keywords: Thresholding, Otsu's method, Image segmentation, Serial images

1. **Introduction.** Many thresholding methods [1,7,8,13-16] have been proposed in the past two decades. Otsu's thresholding method (OTM) [16] has been widely used because of its simplicity. It evaluates each possible threshold using discriminative criterion, and finally takes the one, that maximizes between-class variance or minimizes within-class variance, as the optimal threshold. OTM often provides satisfactory thresholds for separating a set data into classes. However, Hou *et al.* [8] found that the threshold obtained by OTM tends to get closer to the cluster with a larger variance or a larger quantity of

This work was supported by a grant from Research Center for the Humanities and Social Sciences at NCHU.