A Redundancy Removal Method for Bill Images

Li Li*, FangFang Li, and Jian-Feng Lu

Department of Computer Graphics and Image Processing, Hangzhou Dianzi University, Hangzhou 310000, China Lili2008@hdu.edu.cn

Received 10 January 2011; 10 February 2011; Accepted 10 March 2011

Abstract. The digitalization processes of bills produce frequently digital images with a mass of redundant background caused by rotation angles and misoperations in the scanning process. The redundant background occupies much storage space. First, this paper proposes a method that combines Hough transform and mathematical morphology to detect the skew. Secondly, the redundant background of bill images is removed after recognizing the coordinates of the top-left and bottom-right points of the target area. Last, experimental results are given on different types of bill images. The method provided in this paper is automated and simple to implement.

Keywords: Bill images, skew detection, Hough transform, mathematical morphology, automated

References

- I. Konya, S. Eickeler, C. Seibert, "Fast Seamless Skew and Orientation Detection in document images," in *Proceed*ings of International Conference on Pattern Recognition, pp. 1924-1928, 2010.
- [2] H. S. Baird, "The Skew Angle of Printed Documents," *IEEE Computer Society Press, Los Alamitos, CA, USA*, pp. 204-208, 1995.
- [3] S. N. Srihari and V. Govindraju, "Analysis of Textual Images Using the Hough Transform," *Mach. Vision and Applications*, Vol. 2, No. 3, pp. 141-153, 1989.
- [4] H.K. Kwag, S.H. Kim, S.H. Jeong, G.S. Lee, "Efficient Skew Estimation and Correction Algorithm for Document Images," *Image and Vision Computing*, Vol. 20, No. 1, pp. 25-35, 2001.
- B. Yu and A. K. Jain, "A Robust and Fast Skew Detection Algorithm for Generic Documents," *Pattern Recognition*, Vol. 29, No. 10, pp. 1599-1629, 1996.
- [6] C. Hollitt, "Reduction of Computational Complexity of Hough Transforms using a Convolution Approach," in 24th International Conference Image and Vision Computing New Zealand, pp. 373-378, 2009.
- [7] A. Hashizume, P.S. Yeh, A. Rosenfeld, "A Method of Detecting the Orientation of Aligned Components," *Pattern Recognition Letters*, Vol. 4, No. 2, pp. 125-132, 1986.
- [8] Y. Lu and C.L. Tan, "A Nearest-neighbor Chain Based Approach to Skew Estimation in Document Images," *Pattern Recognition Letters*, Vol. 24, No. 14, pp. 2315-2323, 2003.
- [9] Y. Zhao, W. Gui, Z. Chen, "Edge Detection Based on Multi-structure Elements Morphology," in *Proceedings of the 6th World Congress on Intelligent Control and Automation*, pp. 9795-9798, 2006.
- [10] R. C. Gonzalez and R. E. Woods, "Digital Image Processing (Second Edition)," Publishing House of Electronics Industry, 2004.

^{*}Correspondence author

- [11] Z. Hong, "Digital Image Processing," Science Press, pp. 60-61, 2005.
- [12] R. C. Gonzalez, R. E. Woods, S. L. Eddins, "Digital Image Processing Using Matlab," Publishing House of Electronics Industry, 2004.