Abstract

Today, most of desktops, laptops, tablets, and even smart phones are shipped with multi-core processors. The efficient utilization of multi-core processors computation power cannot be achieved by developing traditional applications with sequential algorithms. Parallel algorithms utilize the capabilities of these processors, but need a special design to optimize the application to fit the hardware system. Image processing programs are heavy computational algorithms with very large amount of data. They are very well suited for parallel processing. This work presents a low cost and fast solution for optical mark recognition system working in multi-core processor system. The answer sheet is captured using a digital camera and the image is processed. Initially the borders of the sheet are located then the bubbles are detected. Fast techniques are used to detect the bubbles without a rotation correction. An adaptive binarization has been used to overcome the lighting effects of the camera based images. A classifier is trained to decide if the bubble is marked or not. A dataset of images under different rotations, illuminations, is used to train and test the system. An accuracy of 99.8% is obtained. The algorithms are analyzed and optimized for parallel computation on a multi-core processor. The processing time is reduced to about 40% of the sequential computation time.
- A. Al-Marakeby; Fast Camera based optical mark reader system; Journal of Al Azhar University Engineering Sector (JAUES) 2013 (in press)
- David Doermann, Jian Liang, and Huiping Li; "Progress in Camera-Based Document Image Analysis"; International Conference on Document Analysis and Recognition (ICDAR 2003)
- FUMITAKA KIMURA, KENJI TAKASHINA, SHINJI TSURUOKA, AND YASUJI MIYAKE; "Modified Quadratic Discriminant Functions and the Application to Chinese Character Recognition"; IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE, VOL. PAMI-9, NO. 1, JANUARY 1987
- Harshad B. Prajapat, Dr. Sanjay K. Vij; "Analytical Study of Parallel and Distributed Image Processing"; International Conference on Image Information Processing (ICIIP 2011)
- Hui Deng, Feng Wang, Bo Liang; "A Low-Cost OMR Solution for Educational Applications"; International Symposium on Parallel and Distributed Processing with Applications 2008
- Jie Zhao, Yong-min Yang, Ge Li; "Real-time Image Processing System Base on Multi-core Processor"; 2009 Third International Symposium on Intelligent Information Technology Application
- K. CHINNASARN; "An image-processing oriented optical mark reader"; Applications of digital image processing XXII, Denver CO, 1999
- K. Chua, L. Zhang, Y. Zhang, and C. Tan; "A fast and stable approach for restoration of warped document images"; 8th Int Conf. on Document Analysis and Recognition, 2005
- Luis Miguel Sanchez, Javier Fernandez, Rafael Sotomayor, and J. Daniel Garcia; "A Comparative Evaluation of Parallel Programming Models for Shared-Memory Architectures"; 2012 10th IEEE International Symposium on Parallel and Distributed Processing with Applications
- TienDzung Nguyen, Quyet Hoang Manh; "Efficient and reliable camera based multiple-choice test grading"; system 2011 International Conference on
- Yanwei WANG "MQDF Discriminative Learning Based Offline Handwritten Chinese Character Recognition"; 2011 International Conference on Document Analysis and Recognition

**Index Terms**

Computer Science  
Signal Processing

**Keywords**

Parallel Image Processing  
Multi-Core Processors  
camera based  
OMR