

## PREFACE

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The contributions of this book were first presented at the 17th International Conference on Computer Processing of Oriental Languages (ICCPOL'97), held at the Hong Kong Baptist University, April 2-4, 1997. They were reviewed by three referees, and in many cases revised; from the 148 papers that were presented at the ICCPOL97, 15 on advances in Oriental document analysis and recognition were selected by prominent professionals and experts mainly from Canada, China, Hong Kong, Japan, Korea, Singapore, Taiwan, and USA. Most of them have been expanded or extensively reworked for publication here.

In recent years, rapid progress has been made on computer processing of Oriental languages and the research development in this area has resulted in tremendous changes in the recognition of document images, retrieval of information, input methodologies for texture and interaction of natural languages. The progress of the computer processing of Oriental languages can also be found in multimedia computing and the World Wide Web. Many results in those domains were presented in this conference.

The papers can roughly be classified into four groups:

### *General Description of Oriental Languages*

The paper, "Intriguing Aspects of Oriental Languages" by Suen, Mori, Rim and Wang includes a description of three affiliated Oriental languages: Chinese, Japanese, and Korean. A description of the origins of these three languages and the inter-relationship among them are presented. Drawn from the viewpoints of several experienced researchers in the field of OCR and computational linguistics, it attempts to bring out the intriguing aspects of these three ideographic languages. Numerous references are given and comments on future trends are also presented.

The paper, "Differentiating Between Oriental and European Scripts by Statistical Features" by Lam, Ding and Suen uses a combined analysis of the several discriminating statistical features to identify the documents printed in different languages.

### *Handwriting Processing*

In the paper, “The Generation of Oriental Characters: New Perspectives for Automatic Handwriting Processing”, Plamondon, Guerfali and Li summarize the key concepts behind the so-called vectorial delta-lognormal model. The results from this theory and how this model could be used for Chinese character analysis and processing are presented.

The paper, “A New Synthesizing Method for Handwriting Korean Scripts” by Lee and Cho chooses 11 characteristic parameters which determine the shape of handwriting scripts to generate Korean handwriting scripts. It proposes Beta-velocity model to simulate the cursive stroke movement by manipulating curvilinear and cursive connection for consecutive strokes within a letter or a word.

In the paper, “Gray-Scale Nonlinear Shape Normalization Method for Handwritten Oriental Character Recognition” by Kim and Lee, the nonlinear shape normalization method for handwritten Oriental characters is proposed to minimize the loss of information caused by binarization and to compensate for the shape distortions of characters. The two-dimensional linear interpolation technique is extended to nonlinear space and the extended interpolation is adopted to enhance the quality of the normalized images.

Xiao and Dai in the paper, “On-Line Handwritten Chinese Character Recognition Directed by Components with Dynamic Templates” use 45 basic components for 3,755 categories of daily-used Chinese characters to direct the stroke segment matching of the whole character set. It can reduce the computational complexity of the structural matching and improve the performance. In this research, the reference templates of these components are extracted dynamically from the corresponding segment string of characters when a special matching is carried out. This strategy avoids building multiple templates for the components of the same kind but at different places of the characters.

The paper, “Comparison of Feature Performance and its Application to Feature Combination in Off-Line Handwritten Korean Alphabet Recognition” by Chung, Seo, Kim and Yoon classifies the features into three: geometrical/topological, statistical and global features. For each class, it selects four or five features and performs recognition with PE92 database using neural network. This paper compares the recognition performances and selects the top four among those thirteen features and combines some or all of the features.

In the paper, “Segmentation and Recognition of Continuous Handwriting Chinese Text”, Chen, Loudon, Wu and Zitserman propose a new segmentation method for both on-line and off-line systems to recognize free-format handwritten Chinese character sentences. This method performs basic and fine operations of the segmentation based on the varying spacing thresholds and the minimum variance criteria. A lattice is created from all the segments and the Viterbi algorithm is applied to find the most likely character sequence.

In the paper, “Network-Based Approach to Handwriting Analysis” by Sin and Kim, the starting point of the research is a network of HMMs corresponding to the

whole set of characters. Then it is followed by the assertion that the HMM for on-line script is applied to not only on-line but also other tasks of handwriting synthesis and pen-trajectory recovery in off-line character images. The single network of HMMs and the single principle of DP-based state-observation algorithm are used in this paper.

#### *Document Processing and Input Methodologies*

The paper, “Distributed Autonomous Agents for Chinese Document Image Segmentation” by Liu and Tang presents a novel computational paradigm for extracting text/graphic blocks for the Chinese document images, which is based on a notion of distributed autonomous agents. The paper describes the formalisms as well as the behavioral characteristics of the agents followed by a demonstration of the agents in detecting document blocks from some real-life Chinese document images.

The paper, “Ink Matching of Cursive Chinese Handwritten Annotations” by Lopresti, Ma, Wang and Crisman illustrates a pen-based electronic document annotating and browsing system and methods for searching hand-drawn personal notes employing the described matching schemes. It proposes an ink matching network that applies semantics of Chinese language early in the process of ink matching.

#### *Printed Oriental Character Processing*

Yuen, Feng and Tang in the paper, “Printed Chinese Character Similarity Measurement using Ring Projection and Distance Transform” present a new similarity measurement method. The representation of the character in ring projection space has been proven to be orientation and scale invariant. However, it will be distorted nonlinearly in the presence of noise. To contest such a deficiency, the distance transform is proposed as a nonlinear metric. The similarity measurement is performed using the distance transformed image in ring projection space.

The paper, “A Self-Organizing Hierarchical Classifier for Multi-Lingual Large-Set Oriental Character Recognition” by Park, Song and Lee proposes a practical scheme for multi-lingual, multi-font and multi-size large-set Oriental character recognition. The variations of the character shapes in multi-font and multi-size are absorbed by a modified nonlinear shape normalization method based on the dot density. A hierarchical feature extraction method is adopted to represent the different topological structures of multi-lingual Oriental characters. For classification, the SOFM/LVQ, and LVQ4 techniques have been used.

In order to increase the recognition accuracy, the paper, “Typeface Identification for Printed Chinese Characters” by Tseng, Kuo and Lee, identifies character typefaces before the recognition. Probability distributions for the six typefaces are measured, and the three features and a contextual heuristic are used to classify the typefaces of the characters. Trapezoid-shaped membership functions are constructed to represent the fuzzy numbers for the distribution of each feature. In order to obtain the higher identification rate, a two-level decision tree is utilized.

The paper, “A Reliability Design Methodology for Chinese Character Recognition Systems” by Huang, Liu, Suen and Tang establishes a novel method enabling

the Chinese character recognition systems to have higher reliability. Two thresholds, class region threshold and disambiguity threshold are used in each character, and an algorithm to derive appropriate thresholds is developed. In addition, an iterative learning is applied.

We wish to thank the valuable efforts of all the authors and the referees who have made this book possible, also published as a special issue of the *International Journal of Pattern Recognition and Artificial Intelligence*. We also want to express our appreciation to Ms. Lakshmi Narayan, Editor, for her patience and help in guiding us through this task. We hope that this book will be a valuable addition to the expanding field of Oriental Document Analysis and Recognition Techniques and you will find useful the articles featured in the book.