

2009 10th International Conference on Document Analysis and Recognition

(ICDAR 2009)

**Barcelona, Spain
26 – 29 July 2009**

Pages 1-470



IEEE Catalog Number: CFP09227-PRT
ISBN: 978-1-4244-4500-4

2009 10th International Conference on Document Analysis and Recognition

ICDAR 2009

Table of Contents

Conference Information

Session 1.1 Character and Text Segmentation and Extraction

Text Detection and Localization in Complex Scene Images using Constrained AdaBoost Algorithm	1
<i>Shehzad Muhammad Hanif and Lionel Prevost</i>	
Text Localization in Natural Scene Images Based on Conditional Random Field	6
<i>Yi-Feng Pan, Xinwen Hou, and Cheng-Lin Liu</i>	
Multi-Oriented and Multi-Sized Touching Character Segmentation Using Dynamic Programming	11
<i>Partha Pratim Roy, Umapada Pal, Josep Lladós, and Mathieu Delalandre</i>	
Conspicuous Character Patterns	16
<i>Seiichi Uchida, Ryoji Hattori, Masakazu Iwamura, Shinichiro Omachi, and Koichi Kise</i>	

Session 1.2 Learning Techniques for Handwriting Recognition

Writer Adaptive Training and Writing Variant Model Refinement for Offline Arabic Handwriting Recognition	21
<i>Philippe Dreuw, David Rybach, Christian Gollan, and Hermann Ney</i>	
Semi-supervised Learning for Handwriting Recognition	26
<i>Gregory R. Ball and Sargur N. Srihari</i>	
Evaluating Retraining Rules for Semi-Supervised Learning in Neural Network Based Cursive Word Recognition	31
<i>Volkmar Frinken and Horst Bunke</i>	

Design Compact Recognizers of Handwritten Chinese Characters Using Precision Constrained Gaussian Models, Minimum Classification Error Training and Parameter Compression	36
<i>Yongqiang Wang and Qiang Huo</i>	

Session 1.3 Forensic Document Analysis

On-Line Signature Verification: Directional Analysis of a Signature Using Weighted Relative Angle Partitions for Exploitation of Inter-Feature Dependencies	41
<i>Muhammad Talal Ibrahim, Matthew Kyan, M. Aurangzeb Khan, Khurram Saleem Alimgeer, and Ling Guan</i>	
Biometric Person Authentication Method Using Camera-Based Online Signature Acquisition	46
<i>Daigo Muramatsu, Kumiko Yasuda, and Takashi Matsumoto</i>	
Toward Resisting Forgery Attacks via Pseudo-Signatures	51
<i>Jin Chen, Daniel Lopresti, and Fabian Monroe</i>	
Impact of Alphabet Knowledge on Online Writer Identification	56
<i>Guo Xian Tan, Christian Viard-Gaudin, and Alex C. Kot</i>	

Session 2.1 Camera and Video Document Analysis

Coupled Snakelet Model for Curled Textline Segmentation of Camera-Captured Document Images	61
<i>Syed Saqib Bukhari, Faisal Shafait, and Thomas M. Breuel</i>	
A Laplacian Method for Video Text Detection	66
<i>Trung Quy Phan, Palaiahnakote Shivakumara, and Chew Lim Tan</i>	
Using Multiple Frame Integration for the Text Recognition of Video	71
<i>Jian Yi, Yuxin Peng, and Jianguo Xiao</i>	
Real-Time Camera-Based Recognition of Characters and Pictograms	76
<i>Masakazu Iwamura, Tomohiko Tsuji, Akira Horimatsu, and Koichi Kise</i>	

Session 2.2 Online Handwriting Analysis and Recognition - I

Fast Incremental Learning Strategy Driven by Confusion Reject for Online Handwriting Recognition	81
<i>Abdullah Almaksour and Eric Anquetil</i>	
Learning and Adaptation for Improving Handwritten Character Recognizers	86
<i>Naveen Chandra Tewari and Anoop M. Namboodiri</i>	
Writer Adaptive Online Handwriting Recognition Using Incremental Linear Discriminant Analysis	91
<i>Zhibin Huang, Kai Ding, Lianwen Jin, and Xue Gao</i>	
Using Mouse Feedback in Computer Assisted Transcription of Handwritten Text Images	96
<i>Verónica Romro, Alejandro H. Toselli, and Enrique Vidal</i>	

Session 2.3 Information Spotting

Seal Detection and Recognition: An Approach for Document Indexing	101
<i>Partha Pratim Roy, Umapada Pal, and Josep Lladós</i>	
Fisher Kernels for Handwritten Word-spotting	106
<i>Florent Perronnin and Jose A. Rodriguez-Serrano</i>	
Logo Spotting by a Bag-of-words Approach for Document Categorization	111
<i>Marçal Rusiñol and Josep Lladós</i>	
Slit Style HOG Feature for Document Image Word Spotting	116
<i>Kengo Terasawa and Yuzuru Tanaka</i>	

Poster Session I

Geometric Centroids and their Relative Distances for Off-line Signature Verification	121
<i>H.N. Prakash and D.S. Guru</i>	
Offline Signature Verification Based on Pseudo-Cepstral Coefficients	126
<i>Jesus Francisco Vargas Bonilla, Miguel Angel Ferrer Ballester, Carlos Manuel Travieso Gonzalez, and Jesus Bernandino Alonso Hernandez</i>	
Evaluation of Brute-force Attack to Dynamic Signature Verification Using Synthetic Samples	131
<i>Javier Galbally, Julian Fierrez, Marcos Martinez-Diaz, and Javier Ortega-Garcia</i>	
Multi-Exposure Document Fusion Based on Edge-Intensities	136
<i>Marco Block, Maxim Schaubert, Fabian Wiesel, and Raúl Rojas</i>	
Text-Tracking Wearable Camera System for the Blind	141
<i>Hideaki Goto and Makoto Tanaka</i>	
Real-Time Retrieval for Images of Documents in Various Languages Using a Web Camera	146
<i>Tomohiro Nakai, Koichi Kise, and Masakazu Iwamura</i>	
Camera-Based Ballot Counter	151
<i>George Nagy, Bryan Clifford, Andrew Berg, Glenn Saunders, Dan Lopresti, and Elisa Barney Smith</i>	
A Gradient Difference Based Technique for Video Text Detection	156
<i>Palaiahnakote Shivakumara, Trung Quy Phan, and Chew Lim Tan</i>	
Lexicon-Based Word Recognition Using Support Vector Machine and Hidden Markov Model	161
<i>Abdul Rahim Ahmad, Christian Viard-Gaudin, and Marzuki Khalid</i>	
Scene Text Extraction Using Focus of Mobile Camera	166
<i>Egyul Kim, SeongHun Lee, and JinHyung Kim</i>	
Devanagari and Bangla Text Extraction from Natural Scene Images	171
<i>Ujjwal Bhattacharya, Swapan Kumar Parui, and Srikanta Mondal</i>	

A Steerable Directional Local Profile Technique for Extraction of Handwritten Arabic Text Lines	176
<i>Zhixin Shi, Srirangaraj Setlur, and Venu Govindaraju</i>	
Text Segmentation in Colour Posters from the Spanish Civil War Era	181
<i>Antonio Clavelli and Dimosthenis Karatzas</i>	
Ornamental Letters Image Classification Using Local Dissimilarity Maps	186
<i>Jérôme Landré, Frédéric Morain-Nicolier, and Su Ruan</i>	
Low-Resolution Character Recognition by Video-Based Super-Resolution	191
<i>Ataru Ohkura, Daisuke Deguchi, Tomokazu Takahashi, Ichiro Ide, and Hiroshi Murase</i>	
F-ratio Based Weighted Feature Extraction for Similar Shape Character Recognition	196
<i>Tetsushi Wakabayashi, Umapada Pal, Fumitaka Kimura, and Yasuji Miyake</i>	
Combining Multiple HMMs Using On-line and Off-line Features for Off-line Arabic Handwriting Recognition	201
<i>Mahdi Hamdani, Haikal El Abed, Monji Kherallah, and Adel M. Alimi</i>	
Shape Descriptor Based Document Image Indexing and Symbol Recognition	206
<i>Ehtesham Hassan, Santanu Chaudhury, and M. Gopal</i>	
Language Model Integration for the Recognition of Handwritten Medieval Documents	211
<i>Markus Wüthrich, Marcus Liwicki, Andreas Fischer, Emanuel Indermühle, Horst Bunke, Gabriel Viehhauser, and Michael Stolz</i>	
Style-Based Ballot Mark Recognition	216
<i>Pingping Xiu, Daniel Lopresti, Henry Baird, George Nagy, and Elisa Barney Smith</i>	
Recognition of Degraded Handwritten Characters Using Local Features	221
<i>Markus Diem and Robert Sablatnig</i>	
Locally Developable Constraint for Document Surface Reconstruction	226
<i>Yuanlong Shao, Xinguo Liu, Xueying Qin, Yi Xu, and Hujun Bao</i>	
A Distance-Based Technique for Non-Manhattan Layout Analysis	231
<i>Stefano Ferilli, Marenglen Biba, Floriana Esposito, and Teresa M.A. Basile</i>	
OCD: An Optimized and Canonical Document Format	236
<i>Jean-Luc Bloechle, Denis Lalanne, and Rolf Ingold</i>	
Hybrid Page Layout Analysis via Tab-Stop Detection	241
<i>Raymond W. Smith</i>	
Identification of Very Similar Filled-in Forms with a Reject Option	246
<i>Joaquim Arlandis, Juan-Carlos Perez-Cortes, and Emilio Ungria</i>	
Metadata Extraction from PDF Papers for Digital Library Ingest	251
<i>Simone Marinai</i>	
Form Field Frame Boundary Removal for Form Processing System in Gurmukhi Script	256
<i>Dharam Veer Sharma and Gurpreet Singh Lehal</i>	

Graph b-Coloring for Automatic Recognition of Documents	261
<i>Djamel Gaceb, Véronique Eglin, Frank LeBourgeois, and Hubert Emptoz</i>	
Fusion of Word Spotting and Spatial Information for Figure Caption Retrieval in Historical Document Images	266
<i>Khurram Khurshid, Claudie Faure, and Nicole Vincent</i>	
Segmentation-free Word Spotting in Historical Printed Documents	271
<i>Basilis Gatos and Ioannis Pratikakis</i>	
Automatic Evaluation Framework for Word Spotting	276
<i>Kengo Terasawa, Hajime Imura, and Yuzuru Tanaka</i>	
FHT: An Unconstraint Farsi Handwritten Text Database	281
<i>Majid Ziaratban, Karim Faez, and Fatemeh Bagheri</i>	
HCL2000 - A Large-scale Handwritten Chinese Character Database for Handwritten Character Recognition	286
<i>Honggang Zhang, Jun Guo, Guang Chen, and Chunguang Li</i>	
Compression and String Matching Method for Printed Document Images	291
<i>Hajime Imura and Yuzuru Tanaka</i>	
A Realistic Dataset for Performance Evaluation of Document Layout Analysis	296
<i>Apostolos Antonacopoulos, David Bridson, Christos Papadopoulos, and Stefan Pletschacher</i>	
The GERMANA Database	301
<i>Daniel Pérez, Lionel Tarazón, Nicolás Serrano, Francisco Castro, Oriol Ramos Terrades, and Alfons Juan</i>	
Trinary Image Mosaicing Based Watermark String Detection	306
<i>Jun Sun, Satoshi Naoi, Yusaku Fujii, Hiroaki Takebe, and Yoshinobu Hotta</i>	
A Generic Form Processing Approach for Large Variant Templates	311
<i>Yaakov Navon, Ella Barkan, and Boaz Ophir</i>	
Document Binarization Based on Connected Operators	316
<i>Benoit Naegel and Laurent Wendling</i>	
Document Images Restoration by a New Tensor Based Diffusion Process: Application to the Recognition of Old Printed Documents	321
<i>Fadoua Drira, Frank LeBourgeois, and Hubert Emptoz</i>	
2D CAD Data Mining Based on Spatial Relation	326
<i>Hiroaki Kizu, Junko Yamamoto, Takeshi Takeda, Keiji Gyohten, and Naomichi Sueda</i>	
Keyword Spotting in Document Images through Word Shape Coding	331
<i>Shuyong Bai, Linlin Li, and Chew Lim Tan</i>	
Information Retrieval Model for Online Handwritten Script Identification	336
<i>Guo Xian Tan, Christian Viard-Gaudin, and Alex C. Kot</i>	
Detecting Printed and Handwritten Partial Copies of Line Drawings Embedded in Complex Backgrounds	341
<i>Weihan Sun and Koichi Kise</i>	

Document Image Retrieval with Local Feature Sequences	346
<i>Jilin Li, Zhi-Gang Fan, Yadong Wu, and Ning Le</i>	
Handwritten Word Image Retrieval with Synthesized Typed Queries	351
<i>José A. Rodríguez-Serrano and Florent Perronnin</i>	
Generic Feature Selection and Document Processing	356
<i>Hassan Chouaib, Nicole Vincent, Florence Cloppet, and Salvator Tabbone</i>	
Scalable Feature Extraction from Noisy Documents	361
<i>Loic Lecerf and Boris Chidlovskii</i>	
A New Block Partitioned Text Feature for Text Verification	366
<i>Xiufei Wang, Lei Huang, and Changping Liu</i>	
German Lute Tablature Recognition	371
<i>Christoph Dalitz and Christine Pranzas</i>	
Raster Map Image Analysis	376
<i>Thomas C. Henderson and Trevor Linton</i>	
Information Extraction from Multimodal ECG Documents	381
<i>Fei Wang, Tanveer Syeda-Mahmood, and David Beymer</i>	
A Pixel-level Statistical Structural Descriptor for Shape Measure and Recognition	386
<i>Jing Zhang and Liu Wenyin</i>	
An A Posteriori Probability Calculation Method for Analytic Word Recognition Applicable to Address Recognition	391
<i>Tomoyuki Hamamura, Takuma Akagi, and Bunpei Irie</i>	
Word Image Matching Based on Hausdorff Distances	396
<i>Andrey Andreev and Nikolay Kirov</i>	
A Framework for Adaptation of the Active-DTW Classifier for Online Handwritten Character Recognition	401
<i>Vandana Roy, Sriganesh Madhvanath, Anand S., and Ragunath R. Sharma</i>	
High Performance Chinese/English Mixed OCR with Character Level Language Identification	406
<i>Kai Wang, Jianming Jin, and Qingren Wang</i>	
Arabic Handwriting Recognition Using Restored Stroke Chronology	411
<i>Abdelkarim Elbaati, Houcine Boubaker, Monji Kherallah, Abdellatif Ennaji, Haikal El Abed, and Adel M. Alimi</i>	
Combination of Measurement-Level Classifiers: Output Normalization by Dynamic Time Warping	416
<i>Giuseppe Pirlo, Donato Impedovo, Claudia Adamita Trullo, and Erasmo Stasolla</i>	
Statistical Modeling and Learning for Recognition-Based Handwritten Numeral String Segmentation	421
<i>Yanjie Wang, Xiabi Liu, and Yunde Jia</i>	
A New Method for Writer Identification of Handwritten Farsi Documents	426
<i>F. Shahabi and M. Rahmati</i>	

Session 3.1 Text Line Segmentation

Markov Random Field Based Text Identification from Annotated Machine Printed Documents	431
<i>Xujun Peng, Srirangaraj Setlur, Venu Govindaraju, Ramachandrupa Sitaram, and Kiran Bhuvanagiri</i>	
A Variational Bayes Method for Handwritten Text Line Segmentation	436
<i>Fei Yin and Cheng-lin Liu</i>	
A Unified Framework Based on the Level Set Approach for Segmentation of Unconstrained Double-Sided Document Images Suffering from Bleed-Through	441
<i>Reza Farrahi Moghaddam, David Rivest-Hénault, Itay Bar-Yosef, and Mohamed Cheriet</i>	
Script-Independent Handwritten Textlines Segmentation Using Active Contours	446
<i>Syed Saqib Bukhari, Faisal Shafait, and Thomas M. Breuel</i>	

Session 3.2 Handwriting Analysis and Recognition - I

A Novel Rejection Measurement in Handwritten Numeral Recognition Based on Linear Discriminant Analysis	451
<i>Chun Lei He, Louisa Lam, and Ching Y. Suen</i>	
Indian Multi-Script Full Pin-code String Recognition for Postal Automation	456
<i>Umapada Pal, Rami Kumar Roy, Kaushik Roy, and Fumitaka Kimura</i>	
Bayesian Best-First Search for Pattern Recognition - Application to Address Recognition	461
<i>Tomoyuki Hamamura, Takuma Akagi, and Bunpei Irie</i>	
Handling Out-of-Vocabulary Words and Recognition Errors Based on Word Linguistic Context for Handwritten Sentence Recognition	466
<i>Solen Quiniou, Mohamed Cheriet, and Eric Anquetil</i>	

Session 3.3 Document Classification

Pattern Classification on Local Metric Structure	471
<i>Yoshikazu Washizawa</i>	
Drop Caps Decomposition for Indexing a New Letter Extraction Method	476
<i>Mickaël Coustaty, Jean-Marc Ogier, Rudolf Paret, and Nicole Vincent</i>	
A Rotation Invariant Page Layout Descriptor for Document Classification and Retrieval	481
<i>Albert Gordo and Ernest Valveny</i>	
A Hierarchical Classification Model for Document Categorization	486
<i>Jian-Wu Xu, Vartika Singh, Venu Govindaraju, and Depankar Neogi</i>	

Session 4.1 Historical Document Analysis

A Novel Feature Extraction and Classification Methodology for the Recognition of Historical Documents	491
<i>Georgios Vamvakas, Basilis Gatos, and Stavros J. Perantoni</i>	
Retrieval of the Ornaments from the Hand-Press Period: An Overview	496
<i>Etienne Baudrier, Sébastien Busson, Silvio Corsini, Mathieu Delalandre, Jérôme Landré, and Frédéric Morain-Nicolier</i>	
Word-Based Adaptive OCR for Historical Books	501
<i>Vladimir Kluzner, Asaf Tzadok, Yuval Shimony, Eugene Walach, and Apostolos Antonacopoulos</i>	
A New Framework for Recognition of Heavily Degraded Characters in Historical Typewritten Documents Based on Semi-Supervised Clustering	506
<i>Stefan Pletschacher, Jianying Hu, and Apostolos Antonacopoulos</i>	
Application of Multi-Level Classifiers and Clustering for Automatic Word Spotting in Historical Document Images	511
<i>Reza Farrahi Moghaddam and Mohamed Cheriet</i>	

Session 4.2 Online Handwriting Analysis and Recognition - II

Effect of Improved Path Evaluation for On-line Handwritten Japanese Text Recognition	516
<i>Bilan Zhu, Xiang-Dong Zhou, Cheng-Lin Liu, and Masaki Nakagawa</i>	
Online Handwritten Japanese Character String Recognition Using Conditional Random Fields	521
<i>Xiang-Dong Zhou, Cheng-Lin Liu, and Masaki Nakagawa</i>	
A Study of Feature Design for Online Handwritten Chinese Character Recognition Based on Continuous-Density Hidden Markov Models	526
<i>Lei Ma, Qiang Huo, and Yu Shi</i>	
An Investigation of Imaginary Stroke Technique for Cursive Online Handwriting Chinese Character Recognition	531
<i>Kai Ding, Guoqiang Deng, and Lianwen Jin</i>	
A Character-Structure-Guided Approach to Estimating Possible Orientations of a Rotated Isolated Online Handwritten Chinese Character	536
<i>Tingting He and Qiang Huo</i>	

Session 4.3 Document Image Processing and Enhancement

Threshold Correction of Document Image Binarization for Ruled-line Extraction	541
<i>Hiroshi Tanaka</i>	
Registration and Enhancement of Double-Sided Degraded Manuscripts Acquired in Multispectral Modality	546
<i>Anna Tonazzini, Gianfranco Bianco, and Emanuele Salerno</i>	

Document Image Binarisation Using Markov Field Model	551
<i>Thibault Lelore and Frédéric Bouchara</i>	
Clutter Noise Removal in Binary Document Images	556
<i>Mudit Agrawal and David Doermann</i>	
Robust Color Image Enhancement of Digitized Books	561
<i>Jian Fan</i>	
Session 5.1 Character Recognition	
Robust Recognition of Documents by Fusing Results of Word Clusters	566
<i>Venkat Rasagna, Anand Kumar, C.V. Jawahar, and R. Manmatha</i>	
Learning on the Fly: Font-Free Approaches to Difficult OCR Problems	571
<i>Andrew Kae and Erik Learned-Miller</i>	
Low Cost Correction of OCR Errors Using Learning in a Multi-Engine Environment	576
<i>Ahmad Abdulkader and Mathew R. Casey</i>	
Error-Correcting Output Coding for the Convolutional Neural Network for Optical Character Recognition	581
<i>Huiqun Deng, George Stathopoulos, and Ching Y. Suen</i>	
Session 5.2 Arabic Handwriting Character Recognition	
Isolated Handwritten Farsi Numerals Recognition Using Sparse and Over-Complete Representations	586
<i>W.M. Pan, T.D. Bui, and C.Y. Suen</i>	
Arabic and Latin Script Identification in Printed and Handwritten Types Based on Steerable Pyramid Features	591
<i>Mohamed Benjelil, Slim Kanoun, Rémy Mullot, and Adel M. Alimi</i>	
Confidence-Based Discriminative Training for Model Adaptation in Offline Arabic Handwriting Recognition	596
<i>Philippe Dreuw, Georg Heigold, and Hermann Ney</i>	
Fine Classification of Unconstrained Handwritten Persian/Arabic Numerals by Removing Confusion amongst Similar Classes	601
<i>Alireza Alaei, P. Nagabhushan, and Umapada Pal</i>	
Session 5.3 Document Retrieval	
Logo Matching for Document Image Retrieval	606
<i>Guangyu Zhu and David Doermann</i>	
Bayesian Similarity Model Estimation for Approximate Recognized Text Search	611
<i>Atsuhiko Takasu</i>	
Finding the Most Probable Ranking of Objects with Probabilistic Pairwise Preferences	616
<i>Mikhail Parakhin and Patrick Haluptzok</i>	

Google Newspaper Search – Image Processing and Analysis Pipeline	621
<i>Krishnendu Chaudhury, Ankur Jain, Sriram Thirthala, Vivek Sahasranaman, Shobhit Saxena, and Selvam Mahalingam</i>	

Poster Session II

Handwritten Text Line Segmentation by Shredding Text into its Lines	626
<i>Anguelos Nicolaou and Basilis Gatos</i>	
User-Guided Wrapping of PDF Documents Using Graph Matching Techniques	631
<i>Tamir Hassan</i>	
Handwritten Text Line Identification in Indian Scripts	636
<i>Bidyut Baran Chaudhuri and Sumedha Bera</i>	
Classifying Foreground Pixels in Document Images	641
<i>Prateek Sarkar, Eric Saund, and Jing Lin</i>	
PixLabeler: User Interface for Pixel-Level Labeling of Elements in Document Images	646
<i>Eric Saund, Jing Lin, and Prateek Sarkar</i>	
Text Line Segmentation Based on Morphology and Histogram Projection	651
<i>Rodolfo P. dos Santos, Gabriela S. Clemente, Tsang Ing Ren, and George D.C. Cavalcanti</i>	
A Self-Adaptive Method for Extraction of Document-Specific Alphabets	656
<i>Stefan Pletschacher</i>	
Affixal Approach versus Analytical Approach for Off-Line Arabic Decomposable Vocabulary Recognition	661
<i>Slim Kanoun, Fouad Slimane, Hanène Guesmi, Rolf Ingold, Adel M. Alimi, and Jean Hennebert</i>	
Evaluation of Different Strategies to Optimize an HMM-Based Character Recognition System	666
<i>Murilo Santos, Albert Ko, Luis S. Oliveira, Robert Sabourin, Alessandro L. Koerich, and Alceu S. Britto Jr.</i>	
An Open Source Tesseract Based Optical Character Recognizer for Bangla Script	671
<i>Md. Abul Hasnat, Muttakinur Rahman Chowdhury, and Mumit Khan</i>	
Character Recognition under Severe Perspective Distortion	676
<i>Peng Zhou, Linlin Li, and Chew Lim Tan</i>	
Vector Representation of Graphs: Application to the Classification of Symbols and Letters	681
<i>Nicolas Sidère, Pierre Héroux, and Jean-Yves Ramel</i>	
A Novel Two Stage Evaluation Methodology for Word Segmentation Techniques	686
<i>Georgios Louloudis, Nikolaos Stamatopoulos, and Basilis Gatos</i>	

Invariant Primitives for Handwritten Arabic Script: A Contrastive Study of Four Feature Sets	691
<i>Softiene Haboubi, Samia Maddouri, Noureddine Ellouze, and Haikal El-Abed</i>	
Scaling Up Whole-Book Recognition	698
<i>Pingping Xiu and Henry Baird</i>	
Semi-automatic Forensic Reconstruction of Ripped-up Documents	703
<i>Patrick De Smet</i>	
A Symbol Spotting Approach Based on the Vector Model and a Visual Vocabulary	708
<i>Thi-Oanh Nguyen, Salvatore Tabbone, and Alain Boucher</i>	
A Feedback-Based Multi-Classifer System	713
<i>Giuseppe Pirlo, Claudia Adamita Trullo, and Donato Impedovo</i>	
Machine Authentication of Security Documents	718
<i>Utpal Garain and Biswajit Halder</i>	
Semi-automatic Roof Reconstruction	723
<i>Tong Lu, Yubin Yang, Feng Su, and Zhengxing Sun</i>	
Robustness of Signature Verification Systems to Imitators with Increasing Skills	728
<i>Fernando Alonso-Fernandez, Julian Fierrez, Almudena Gilperez, Javier Galbally, and Javier Ortega-Garcia</i>	
Document Analysis Support for the Manual Auditing of Elections	733
<i>Daniel Lopresti, Xiang Zhou, Xiaolei Huang, and Gang Tan</i>	
Constant-Time Locally Optimal Adaptive Binarization	738
<i>Iuliu Konya, Christoph Seibert, Stefan Eickeler, and Sebastian Glahn</i>	
Enhanced Text Extraction from Arabic Degraded Document Images Using EM Algorithm	743
<i>Wafa Boussellaa, Aymen Bougacha, Abderrazak Zahour, Haikal El Abed, and Adel Alimi</i>	
Feature Based Binarization of Document Images Degraded by Uneven Light Condition	748
<i>Jung Gap Kuk and Nam Ik Cho</i>	
Manuscript Bleed-through Removal via Hysteresis Thresholding	753
<i>Rolando Estrada and Carlo Tomasi</i>	
Pre-Processing of Degraded Printed Documents by Non-local Means and Total Variation	758
<i>Laurence Likforman-Sulem, Jérôme Darbon, and Elisa H. Barney Smith</i>	
Character-SIFT: A Novel Feature for Offline Handwritten Chinese Character Recognition	763
<i>Zhiyi Zhang, Lianwen Jin, Kai Ding, and Xue Gao</i>	
Page Rule-Line Removal Using Linear Subspaces in Monochromatic Handwritten Arabic Documents	768
<i>Wael Abd-Almageed, Jayant Kumar, and David Doermann</i>	

Improvements in BBN's HMM-Based Offline Arabic Handwriting Recognition System	773
<i>Shirin Saleem, Huaigu Cao, Krishna Subramanian, Matin Kamali, Rohit Prasad, and Prem Natarajan</i>	
New Algorithm of Straight or Curved Baseline Detection for Short Arabic Handwritten Writing	778
<i>Houcine Boubaker, Monji Kherallah, and Adel M. Alimi</i>	
HMM Based Handwritten Word Recognition System by Using Singularities	783
<i>Sebastiano Impedovo, Anna Ferrante, and Raffaele Modugno</i>	
Shape Encoded Post Processing of Gurmukhi OCR	788
<i>Dharam Veer Sharma, Gurpreet Singh Lehal, and Sarita Mehta</i>	
Segmentation of Arabic Handwriting Based on both Contour and Skeleton Segmentation	793
<i>Safwan Wshah, Zhixin Shi, and Venu Govindaraju</i>	
A Kai Style Calligraphic Beautification Method for Handwriting Chinese Character	798
<i>Weiping Xia and Lianwen Jin</i>	
Stochastic Model of Stroke Order Variation	803
<i>Yoshinori Katayama, Seiichi Uchida, and Hiroaki Sakoe</i>	
Recognition of Handwritten Numerical Fields in a Large Single-Writer Historical Collection	808
<i>Marius Bulacu, Axel Brink, Tijn van der Zant, and Lambert Schomaker</i>	
Spatial and Spectral Based Segmentation of Text in Multispectral Images of Ancient Documents	813
<i>Martin Lettner and Robert Sablatnig</i>	
Revealing the Visually Unknown in Ancient Manuscripts with a Similarity Measure for IR-Imaged Inks	818
<i>Aaron Licata, Alexandra Psarrou, and Vassiliki Kokla</i>	
Italic or Roman: Word Style Recognition without A Priori Knowledge for Old Printed Documents	823
<i>Loris Eynard and Hubert Emptoz</i>	
Restoration and Segmentation of Highly Degraded Characters Using a Shape-Independent Level Set Approach and Multi-level Classifiers	828
<i>Reza Farrahi Moghaddam, David Rivest-Henault, and Mohamed Cheriet</i>	
Steerable Pyramid Based Complex Documents Images Segmentation	833
<i>Mohamed Benjelil, Slim Kanoun, Rémy Mullot, and Adel M. Alimi</i>	
A Method for Automatically Extracting Road Layers from Raster Maps	838
<i>Yao-Yi Chiang and Craig A. Knoblock</i>	
Learning Rich Hidden Markov Models in Document Analysis: Table Location	843
<i>Ana Costa e Silva</i>	

Seizing the Treasure: Transferring Knowledge in Invoice Analysis	848
<i>Frederick Schulz, Markus Ebbecke, Michael Gillmann, Benjamin Adrian, Stefan Agne, and Andreas Dengel</i>	
Unconstrained Handwritten Document Layout Extraction Using 2D Conditional Random Fields	853
<i>Florent Montreuil, Emmanuèle Grosicki, Laurent Heutte, and Stéphane Nicolas</i>	
“The Godfather” vs. “Chaos”: Comparing Linguistic Analysis Based on On-line Knowledge Sources and Bags-of-N-Grams for Movie Review Valence Estimation	858
<i>Björn Schuller, Joachim Schenk, Gerhard Rigoll, and Tobias Knaup</i>	
Improvements in Keyword Search Japanese Characters within Handwritten Digital Ink	863
<i>Cheng Cheng, Bilan Zhu, Xiaorong Chen, and Masaki Nakagawa</i>	
Hierarchical On-line Arabic Handwriting Recognition	867
<i>Raid Saabni and Jihad El-Sana</i>	
Pen Acoustic Emissions for Text and Gesture Recognition	872
<i>Andrew Seniuk and Dorothea Blostein</i>	
GMs in On-Line Handwritten Whiteboard Note Recognition: The Influence of Implementation and Modeling	877
<i>Joachim Schenk, Benedikt Hörnler, Björn Schuller, Artur Braun, and Gerhard Rigoll</i>	
Using top n Recognition Candidates to Categorize On-line Handwritten Documents	881
<i>Sebastián Peña Saldarriaga, Emmanuel Morin, and Christian Viard-Gaudin</i>	
Recognition-Based Segmentation Algorithm for On-Line Arabic Handwriting	886
<i>Khaled Daifallah, Nizar Zarka, and Hassan Jamous</i>	
A Framework Based on Semi-Supervised Clustering for Discovering Unique Writing Styles	891
<i>Bharath A. and Sriganesh Madhvanath</i>	
Embedded Bernoulli Mixture HMMs for Handwritten Word Recognition	896
<i>Adrià Giménez and Alfons Juan</i>	
A Collaborative Interface for Multimodal Ink and Audio Documents	901
<i>Amit Regmi and Stephen M. Watt</i>	
PDF-TREX: An Approach for Recognizing and Extracting Tables from PDF Documents	906
<i>Ermelinda Oro and Massimo Ruffolo</i>	
Analysis of Book Documents’ Table of Content Based on Clustering	911
<i>Liangcai Gao, Zhi Tang, Xiaofan Lin, Xin Tao, and Yimin Chu</i>	
An RDF-Based Blackboard Architecture for Improving Table Analysis	916
<i>Vanessa Long</i>	

Extraction of Nom Text Regions from Stele Images Using Area Voronoi Diagram	921
<i>Thai V. Hoang, Salvatore Tabbone, and Ngoc-Yen Pham</i>	
Two-stage Approach for Word-wise Script Identification	926
<i>Sukalpa Chanda, Srikanta Pal, Katrin Franke, and Umapada Pal</i>	
Online Text-independent Writer Identification Based on Temporal Sequence and Shape Codes	931
<i>Bangy Li and Tieniu Tan</i>	
Author Identification Using Compression Models	936
<i>D. Pavelec, L.S. Oliveira, E. Justino, F.D. Nobre Neto, and L.V. Batista</i>	
Session 6.1 Performance Evaluation and Ground-truthing	
Results of the RIMES Evaluation Campaign for Handwritten Mail Processing	941
<i>Emmanuèle Grosicki, Matthieu Carré, Jean-Marie Brodin, and Edouard Geoffrois</i>	
A New Arabic Printed Text Image Database and Evaluation Protocols	946
<i>Fouad Slimane, Rolf Ingold, Slim Kanoun, Adel M. Alimi, and Jean Hennebert</i>	
A Tool for Ground-Truthing Text Lines and Characters in Off-Line Handwritten Chinese Documents	951
<i>Fei Yin, Qiu-feng Wang, and Cheng-lin Liu</i>	
A Methodology for Document Image Dewarping Techniques Performance Evaluation	956
<i>Nikolaos Stamatopoulos, Basilis Gatos, and Ioannis Pratikakis</i>	
Session 6.2 Statistical Classifier-Based Handwriting Recognition	
HMM-Based Handwritten Amharic Word Recognition with Feature Concatenation	961
<i>Yaregal Assabie and Josef Bigun</i>	
Learning Bayesian Networks by Evolution for Classifier Combination	966
<i>Claudio De Stefano, Francesco Fontanella, Alessandra Scotto di Freca, and Angelo Marcelli</i>	
Stochastic Segment Modeling for Offline Handwriting Recognition	971
<i>Prem Natarajan, Krishna Subramanian, Anurag Bhardwaj, and Rohit Prasad</i>	
Maximum Margin Training of Gaussian HMMs for Handwriting Recognition	976
<i>Trinh-Minh-Tri Do and Thierry Artières</i>	
Session 6.3 Writer Identification and Verification	
A Set of Chain Code Based Features for Writer Recognition	981
<i>Imran Siddiqi and Nicole Vincent</i>	
Hierarchical Shape Primitive Features for Online Text-independent Writer Identification	986
<i>Bangy Li, Zhenan Sun, and Tieniu Tan</i>	

Off-Line Multi-Script Writer Identification Using AR Coefficients991
Utpal Garain and Thierry Paquet

On the Use of Textural Features for Writer Identification in Old Handwritten
Music Scores996
Alicia Fornés, Josep Lladós, Gemma Sánchez, and Horst Bunke

Session 7.1 Page Segmentation and Layout Analysis

Text Lines and Snippets Extraction for 19th Century Handwriting Documents
Layout Analysis1001
*Vincent Malleron, Véronique Eglin, Hubert Emptoz, Stéphanie Dord-Crouslé,
and Philippe Régnier*

Improving the Table Boundary Detection in PDFs by Fixing the Sequence
Error of the Sparse Lines1006
Ying Liu, Kun Bai, Prasenjit Mitra, and C. Lee Giles

Voronoi++: A Dynamic Page Segmentation Approach Based on Voronoi
and Docstrum Features1011
Mudit Agrawal and David Doermann

Context-oriented Layout Optimization of Large-Print Textbooks1016
Itaru Tatsumi, Hitoshi Habe, and Masatsugu Kidode

Session 7.2 Handwriting Analysis and Recognition - II

Prototype Selection for Handwritten Connected Digits Classification1021
Cristiano de Santana Pereira and George D.C. Cavalcanti

Recognition of Handwritten Chinese Characters by Combining Regularization,
Fisher's Discriminant and Distorted Sample Generation1026
K.C. Leung and C.H. Leung

From Isolated Handwritten Characters to Fields Recognition: There's Many
a Slip Twixt Cup and Lip1031
Christopher Kermorvant, Anne-Laure Bianne, Patrick Marty, and Farès Menasri

Integrating Language Model in Handwritten Chinese Text Recognition1036
Qiu-Feng Wang, Fei Yin, and Cheng-Lin Liu

Session 7.3 Scientific Document Recognition

Mathematical Symbol Indexing Using Topologically Ordered Clusters
of Shape Contexts1041
Simone Marinai, Beatrice Miotti, and Giovanni Soda

Towards Handwritten Mathematical Expression Recognition1046
Ahmad-Montaser Awal, Harold Mouchère, and Christian Viard-Gaudin

Utilizing Consistency Context for Handwritten Mathematical Expression
Recognition1051
Kang Kim, Taik Heon Rhee, Jae Seung Lee, and Jin Hyung Kim

The Understanding and Structure Analyzing for Online Handwritten Chemical Formulas	1056
<i>Xin Wang, Guangshun Shi, and Jufeng Yang</i>	

Poster Session III

A Survey of Techniques for Document and Archaeology Artefact Reconstruction	1061
<i>Florian Kleber and Robert Sablatnig</i>	
A New Approach for Skew Correction of Documents Based on Particle Swarm Optimization	1066
<i>Javad Sadri and Mohamed Cheriet</i>	
New Trends in Digital Scanning Processes	1071
<i>Sebastiano Impedovo, Raffaele Modugno, Anna Ferrante, and Erasmo Stasolla</i>	
Document Content Extraction Using Automatically Discovered Features	1076
<i>Sui-Yu Wang, Henry Baird, and Chang An</i>	
Graphological Analysis of Handwritten Text Documents for Human Resources Recruitment	1081
<i>Ricard Coll, Alicia Fornés, and Josep Lladós</i>	
Using Kernel Density Classifier with Topic Model and Cost Sensitive Learning for Automatic Text Categorization	1086
<i>Dwi Sianto Mansjur, Ted S. Wada, and Biing Hwang Juang</i>	
Unsupervised HMM Adaptation Using Page Style Clustering	1091
<i>Huaigu Cao, Rohit Prasad, Shirin Saleem, and Premkumar Natarajan</i>	
Finding Images and Line-Drawings in Document-Scanning Systems	1096
<i>Shumeet Baluja and Michele Covell</i>	
Detection of Incoherences in a Document Corpus Based on the Application of a Neuro-Fuzzy System	1101
<i>Susana Martín, Víctor Arribas, and Gregorio I. Sáinz</i>	
Image Classification to Improve Printing Quality of Mixed-Type Documents	1106
<i>Rafael Dueire Lins, Gabriel Pereira e Silva, Steven J. Simske, Jian Fan, Mark Shaw, Paulo Sá, and Marcelo Thielo</i>	
Comparative Study of Devnagari Handwritten Character Recognition Using Different Feature and Classifiers	1111
<i>Umapada Pal, Tetsushi Wakabayashi, and Fumitaka Kimura</i>	
Temporal Order Recovery of the Scanned Handwriting	1116
<i>Abdelkarim Elbaati, Monji Kherallah, Abdellatif Ennaji, and Adel M. Alimi</i>	
Explicit Fuzzy Modeling of Shapes and Positioning for Handwritten Chinese Character Recognition	1121
<i>Adrien Delaye, Eric Anquetil, and Sébastien Macé</i>	

Rejection Strategies with Multiple Classifiers for Handwritten Character Recognition	1126
<i>Xu-Cheng Yin, Hong-Wei Hao, Yun-Feng Tang, Jun Sun, and Satoshi Naoi</i>	
A New Method for Rotation Free Method for Online Unconstrained Handwritten Chinese Word Recognition: A Holistic Approach	1131
<i>Kai Ding, Lianwen Jin, and Xue Gao</i>	
A Novel Approach for Rotation Free Online Handwritten Chinese Character Recognition	1136
<i>Shengming Huang, Lianwen Jin, and Jin Lv</i>	
Hierarchical Decomposition of Handwriting Deformation Vector Field Using 2D Warping and Global/Local Affine Transformation	1141
<i>Toru Wakahara and Seiichi Uchida</i>	
Recurrent HMMs and Cursive Handwriting Recognition Graphs	1146
<i>Marc-Peter Schambach</i>	
Unsupervised Selection and Discriminative Estimation of Orthogonal Gaussian Mixture Models for Handwritten Digit Recognition	1151
<i>Xuefeng Chen, Xiabi Liu, and Yunde Jia</i>	
Writer Adaptation for Online Handwriting Recognition System Using Virtual Examples	1156
<i>Hidetoshi Miyao and Minoru Maruyama</i>	
Line Segmentation for Degraded Handwritten Historical Documents	1161
<i>Itay Bar-Yosef, Nate Hagbi, Klara Kedem, and Itshak Dinstein</i>	
A Dual Taxonomy for Defects in Digitized Historical Photos	1166
<i>Edoardo Ardizzone, A. De Polo, Haris Dindo, Giuseppe Mazzola, and C. Nanni</i>	
A Modified Adaptive Logical Level Binarization Technique for Historical Document Images	1171
<i>Konstantinos Ntirogiannis, Basilis Gatos, and Ioannis Pratikakis</i>	
Automatic Corresponding Control Points Selection for Historical Document Image Registration	1176
<i>Jie Wang, Michael S. Brown, and Chew Lim Tan</i>	
How to Improve a Handwriting Recognition System	1181
<i>Haikal El Abed and Volker Märgner</i>	
Combining Alignment Results for Historical Handwritten Document Analysis	1186
<i>Emanuel Indermühle, Marcus Liwicki, and Horst Bunke</i>	
Separate Chinese Character and English Character by Cascade Classifier and Feature Selection	1191
<i>Yuanping Zhu, Jun Sun, Akihiro Minagawa, Yoshinobu Hotta, and Satoshi Naoi</i>	
A Multi-Lingual Recognition System for Arabic and Latin Handwriting	1196
<i>Yousri Kessentini, Thierry Paquet, and AbdelMajid Ben Hamadou</i>	

Modeling, Classifying and Annotating Weakly Annotated Images Using Bayesian Network	1201
<i>Sabine Barrat and Salvatore Tabbone</i>	
CASIA-OLHWDB1: A Database of Online Handwritten Chinese Characters	1206
<i>Da-Han Wang, Cheng-Lin Liu, Jin-Lun Yu, and Xiang-Dong Zhou</i>	
Recognition of On-Line Handwritten Commutative Diagrams	1211
<i>Andreas Stoffel, Ernesto Tapia, and Raúl Rojas</i>	
An Improved Online Tamil Character Recognition Engine Using Post-Processing Methods	1216
<i>Suresh Sundaram and Angarai Ganesan Ramakrishnan</i>	
PENTTOOLS - A MATLAB Toolkit for On-line Pen-Based Data Experimentation	1221
<i>Richard M. Guest</i>	
Affine Distortion Compensation for an Isolated Online Handwritten Chinese Character Using Combined Orientation Estimation and HMM-Based Minimax Classification	1226
<i>Tingting He and Qiang Huo</i>	
Efficient Generation of Comprehensive Database for Online Arabic Script Recognition	1231
<i>Raid Saabni and Jihad El-Sana</i>	
Capturing Digital Ink as Retrieving Fragments of Document Images	1236
<i>Kazumasa Iwata, Koichi Kise, Tomohiro Nakai, Masakazu Iwamura, Seiichi Uchida, and Shinichiro Omachi</i>	
Rearrangement of Recognized Strokes in Online Handwritten Gurmukhi Words Recognition	1241
<i>Anuj Sharma, Rajesh Kumar, and R.K. Sharma</i>	
A Probabilistic Framework for Soft Target Learning in Online Cursive Handwriting Recognition	1246
<i>Xiaoyuan Zhu, Yong Ge, Fengjun Guo, and Lixin Zhen</i>	
Selecting Features in On-Line Handwritten Whiteboard Note Recognition: SFS or SFFS?	1251
<i>Joachim Schenk, Moritz Kaiser, and Gerhard Rigoll</i>	
HMM-Based Online Recognition of Handwritten Chemical Symbols	1255
<i>Yang Zhang, Guangshun Shi, and Jufeng Yang</i>	
Improving a DTW-Based Recognition Engine for On-line Handwritten Characters by Using MLPs	1260
<i>María José Castro-Bleda, Salvador España-Boquera, Jorge Gorbe-Moya, Francisco Zamora-Martínez, David Llorens-Piñana, Andrés Marzal-Varó, Federico Prat-Villar, and Juan Miguel Vilar-Torres</i>	
Online Recognition of Multi-Stroke Symbols with Orthogonal Series	1265
<i>Oleg Golubitsky and Stephen M. Watt</i>	

Development and Evaluation of Text Localization Techniques Based on Structural Texture Features and Neural Classifiers	1270
<i>Christos Emmanouilidis, Costas Batsalas, and Nikos Papamarkos</i>	
Automated Ground Truth Data Generation for Newspaper Document Images	1275
<i>Thomas Strecker, Joost van Beusekom, Sahin Albayrak, and Thomas M. Breuel</i>	
Robust Extraction of Text from Camera Images	1280
<i>Shyama Prosad Chowdhury, Soumyadeep Dhar, Amit Kumar Das, Bhabatosh Chanda, and Karen McMenemy</i>	
A Robust Wavelet Transform Based Technique for Video Text Detection	1285
<i>Palaiahnakote Shivakumara, Trung Quy Phan, and Chew Lim Tan</i>	
Disease-Specific Extraction of Text from Cardiac Echo Videos for Decision Support	1290
<i>Tanveer Syeda-Mahmood, David Beymer, and Arnon Amir</i>	
Improving the Enrollment in Dynamic Signature Verification with Synthetic Samples	1295
<i>Javier Galbally, Julian Fierrez, Marcos Martinez-Diaz, and Javier Ortega-Garcia</i>	
Global Features for the Off-Line Signature Verification Problem	1300
<i>Vu Nguyen, Michael Blumenstein, and Graham Leedham</i>	
An Investigation of Predictive Profiling from Handwritten Signature Data	1305
<i>Michael C. Fairhurst and Márjory Cristiany Da Costa Abreu</i>	
Capturing Reliable Data for Computer-Based Forensic Handwriting Analysis II: Pen-position Activations	1310
<i>Katrin Franke</i>	
A Multi-Hypothesis Approach for Off-Line Signature Verification with HMMs	1315
<i>Luana Batista, Eric Granger, and Robert Sabourin</i>	
Symbol Detection Using Region Adjacency Graphs and Integer Linear Programming	1320
<i>Pierre Le Bodic, Hervé Locteau, Sébastien Adam, Pierre Hérroux, Yves Lecourtier, and Arnaud Knippel</i>	
Graphic Symbol Recognition Using Graph Based Signature and Bayesian Network Classifier	1325
<i>Muhammad Muzzamil Luqman, Thierry Brouard, and Jean-Yves Ramel</i>	
Inductive Logic Programming for Symbol Recognition	1330
<i>K.C. Santosh, Bart Lamiroy, and Jean-Philippe Ropers</i>	
Logo Detection in Document Images Based on Boundary Extension of Feature Rectangles	1335
<i>Hongye Wang and Youbin Chen</i>	
Identification of Mathematical Expressions in Document Images	1340
<i>Utpal Garain</i>	

A Unified Framework for Recognizing Handwritten Chemical Expressions	1345
<i>Ming Chang, Shi Han, and Dongmei Zhang</i>	
Statistical Classification of Spatial Relationships among Mathematical Symbols	1350
<i>Walaa Aly, Seiichi Uchida, Akio Fujiyoshi, and Masakazu Suzuki</i>	
Issues in Performance Evaluation: A Case Study of Math Recognition	1355
<i>Adrien Lapointe and Dorothea Blostein</i>	
Syntactic Detection and Correction of Misrecognitions in Mathematical OCR	1360
<i>Akio Fujiyoshi, Masakazu Suzuki, and Seiichi Uchida</i>	
Extraction of Characters on Signboards in Natural Scene Images by Stump Classifiers	1365
<i>Minoru Maruyama and Takuma Yamaguchi</i>	
Competition Session	
ICDAR 2009 Page Segmentation Competition	1370
<i>Apostolos Antonacopoulos, Stefan Pletschacher, David Bridson, and Christos Papadopoulos</i>	
ICDAR 2009 Document Image Binarization Contest (DIBCO 2009)	1375
<i>Basilis Gatos, Konstantinos Ntirogiannis, and Ioannis Pratikakis</i>	
ICDAR 2009 Arabic Handwriting Recognition Competition	1383
<i>Volker Märgner and Haikal El Abed</i>	
ICDAR 2009 Online Arabic Handwriting Recognition Competition	1388
<i>Haikal El Abed, Volker Märgner, Monji Kherallah, and Adel M. Alimi</i>	
ICDAR 2009 Handwriting Segmentation Contest	1393
<i>Basilis Gatos, Nikolaos Stamatopoulos, and Georgios Louloudis</i>	
ICDAR 2009 Handwriting Recognition Competition	1398
<i>Emmanuèle Grosicki and Haikal El Abed</i>	
ICDAR 2009 Signature Verification Competition	1403
<i>Vivian L. Blankers, C. Elisa van den Heuvel, Katrin Y. Franke, and Louis G. Vuurpijl</i>	
ICDAR 2009 Book Structure Extraction Competition	1408
<i>Antoine Doucet, Gabriella Kazai, Bodin Dresevic, Aleksandar Uzelac, Bogdan Radakovic, and Nikola Todic</i>	
ICDAR 2009 Handwritten Farsi/Arabic Character Recognition Competition	1413
<i>Saeed Mozaffari and Hadi Soltanizadeh</i>	

Author Index