# The 4th International Workshop on Multimedia Data Mining (MDM/KDD2003)

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## ABSTRACT

In this short report we provide a summary of the presentations, conclusions and directions of future work that were discussed during MDM/KDD2003 workshop, held in conjunction with the 9th ACM SIGKDD International conference on Knowledge Discovery and Data Mining, August 27, 2003 at Washington, DC, USA.

## Keywords

Multimedia data mining, multimedia information retrieval, knowledge discovery, semantic image classification, clustering, and video analysis.

## 1. INTRODUCTION

The fourth international workshop on Multimedia Data Mining is a continuation of series of past workshops (MDM/KDD 2000 held in Boston, USA, MDM/KDD 2001 held in San Francisco, USA, MDM/KDD 2002 held in Alberta, Canada) under the auspices of the ACM SIGKDD forums. The theme of this most recent workshop was "Integrated Mining." The workshop focused on issues specifically related to mining information in integrated form from multi-modality, multi-source, and multi-format data sources. With the current state of the art of multimedia technology, data are collected from several sources, including static databases, streaming data, web pages, or collected conditionally. Furthermore, this collected data appears in multiple forms, including structured, numeric, free text, video, image, or speech forms, or in the form of combinations of several types. Therefore, the analysis and mining of this data requires combining various techniques and methods of integration. Hence, submission of papers on the following topics was invited:

- Integration of mining techniques
- Multimedia mining methods and algorithms
- Multi-format mining application
- Data preparation, manipulation, and integration
- Data presentation, representation of results, and usage of results

Program committee members of this workshop have been extended in comparison to past workshops in order to cover a wide range of topics (see the PC member list below) and represent 11 countries: Australia, Azerbaijan, Belgium, Canada, France, Germany, Netherlands, Singapore, Slovenia, UK, and USA. A substantial number of high quality papers were submitted to the workshop from 6 different countries: Australia, China, France, Germany, Japan, and USA. Each paper has been reviewed by at least three program committee members. Reviewers' scores were aggregated and the fifteen papers with the highest composed scores have been selected for publication and presentation at the workshop.

The workshop was organized into four sessions. The first two sessions were devoted to *theory, methodology and tools for multimedia data mining*, and include eight papers. The last two sessions cover the topics related to *multimedia mining for information retrieval*, and include seven papers. Finally, the workshop concluded with a stimulating open discussion. A brief overview of the contributed papers appears below. Before the sessions started the Workshop co-chair Dr. Valery A. Petrushin gave a short presentation on the history of the Workshop, the current state of the art in the field and mentioned some trends in multimedia data mining research such as

- Moving from analysis of produced data (news videos and recordings, movies) to "natural" data (Webcams' output, surveillance video, meeting audio and video recordings, home videos, amateur photos, etc.).
- Integrating various media stream (audio, video, text) features and domain knowledge.
- Using Standards such as MPEG-1/2/4; MPEG-7, and MPEG-21.
- Improving cross-organizational collaboration becoming a must. No single lab can cover the range of expertise that is required to build a full-fledge intelligent multimedia annotation and search system.

## 2. CONTRIBUTED PAPERS

The first session in the morning consisted of four papers. In the first paper Mingkun Li, Gang Wei, Valery A. Petrushin, and Ishwar K. Sethi (Oakland University and Accenture Technology Labs, USA) presented their work on *developing audio processing agents for multi-agent MPEG-7 enabled environment.* They introduced a methodology for developing audio processing agents for a multi-agent environment that is known as the Community of Multimedia Agents, which is a virtual community of researchers who developing multimedia processing and annotation agents utilizing the MPEG-7 Standard. In the second paper Simeon J. Simoff and Robert P. Biuk-Aghai (University of Technology, Sydney, Australia and University of Macau, China) presented a novel approach to *integrated media mining for virtual workspace design*. The approach for supporting design and redesign of virtual workspaces is based on combining integrated data mining techniques for refining the lower level models with reverse engineering cycle to create upper level models. In the third paper Yuya Matsuo, Kimiaki Shirahama and Kuniaki Uehara (Kobe University, Japan) presented their work on v*ideo data mining for extracting cinematic rules from a movie*. The authors proposed

various methods of extracting cinematic rules from a video stream by exploiting traditional data mining techniques. Extracted patterns are then have been used for editing new videos. In the final paper of the session, Milind R. Naphade and John R. Smith (IBM Thomas J. Watson Research Center, USA) presented their work on *mining the semantics of visual concepts and context*. The authors presented a hybrid framework that can combine discriminant or generative models for concepts with probabilistic graphical network models for context. Using the TREC Video 2002 benchmark corpus they showed that a robust model can be built for twelve diverse visual semantic concepts.

The second session also consisted of four papers. In the first paper Shu-Ching Chen, Mei-Ling Shyu, Chengcui Zhang, Lin Luo, and Min Chen (Florida International University and University of Miami, USA) presented an approach to *detection of soccer goal shots using joint multimedia features and classification rules*. The authors proposed an effective data mining framework for automatic extraction of goal events in soccer videos. The extracted goal events can be used for high-level indexing and selective browsing of soccer videos. The proposed framework fully exploits the rich semantic information contained in visual and audio features for soccer video data, and incorporates the data mining process for effective detection of soccer goal events. In the second paper of the session, Marcin Detyniecki (University of Paul and Marie Curie, Paris, France) presented his research on *discovering rules using fuzzy decision trees for better visual indexing based on colors.* The author used a fuzzy decision tree algorithm to extract rules that can be interpreted as guidelines for the development of better indexing tools from color proportions of key frames extracted from video-news broadcast. In the third paper Jessica Lin, Michail Vlachos, Eamonn Keogh, and Dimitrios Gunopulos (University of California at Riverside, USA) proposed *multi-resolution K-means clustering of time series and application to images.* The authors introduced a novel anytime version of a *K*-means clustering algorithm for time series data with the characteristics of the high dimensionality, very high feature correlation, and a large amount of noise. In particular, initial clustering is performed with a very coarse resolution representation of the data, and then the results obtained from this "quick and dirty" clustering are used to initialize clustering at a slightly finer level of approximation. This approach has been applied to clustering images on the Web. In the final paper of the session, Xin Li, William I. Grosky, and Farshad Fotouhi (Wayne State University and the University of Michigan, USA) proposed *detecting region borders for image annotation*. Their proposed new method detects borders of regions based on wavelets, which allows avoiding the problem of over-segmentation. The method has been tested for satellite images and essentially improved the accuracy of border recognition for regions with mixed texture.

The third session at the afternoon had four papers. In the first paper Stefan Brecheisen, Hans-Peter Kriegel, Peer Kroger, Martin Pfeifle, and Maximilian Viermetz (University of Munich, Germany) proposed *representatives for visually analyzing cluster hierarchies.* The authors showed how visualizing the hierarchical clustering structure of a database of objects can help a user in the time consuming task of finding similar objects. The authors introduced approaches, which automatically extract the significant clusters in a hierarchical representation of clusters, along with suitable cluster representatives. In the second paper Lei Wang, Mohamad Bayan, Latifur Khan and Vijay Bhombore Rao (University of Texas at Dallas, USA) presented *a new hierarchical approach for image clustering.* They proposed a clustering method based on unsupervised neural nets and self-organizing maps. They developed a dynamic growing self-organizing tree algorithm to construct a hierarchy from top to bottom. The proposed algorithm outperforms the traditional Hierarchical Agglomerative Clustering algorithm. In the third paper Marinette Bouet and Marie-Aude Aufaure (Blaise Pascal University of Clermont-Ferrand and INRIA, France) presented their research on *towards better large image database exploration and exploitation: image mining and visual ontology.* They introduced new descriptors to integrate image semantics. Combining clustering and association rules allows reducing the search space and producing a characterization of an image database. Ontology-based navigation also can be seen as a user-friendly and powerful tool to retrieve relevant information. In the final paper of the session, Clark F. Olson (University of Washington, Bothell, USA) presented *image mining by matching exemplars using entropy.* The author demonstrated that data can be mined from image and video databases by performing matching against exemplars. The matching techniques are based on comparing the local entropy in the images at some relative position that can encompass translation, rotation, scaling, and skew.

At the final session three papers have been presented. First,. Sergio A. Alvarez, Takeshi Kawato, and Carolina Ruiz (Boston College and Worcester Polytechnic Institute, USA) presented the *mining over loosely coupled data sources using neural experts.* They presented an artificial neural networks architecture that enables faster back propagation training in the presence of multiple loosely coupled data sources. In the second paper Jianping Fan, Yuli Gao, Hangzao Luo, and Mohand-Said Hacid (University of North Carolina, USA and University of Lyon, France) proposed *a novel framework for semantic image classification and benchmark.* Their semantic image classification technique obtained very good performance by exploiting novel semantic-sensitive image content representation and semantic image concept formulation to bridge the semantic gap. In the final paper of the session, Julien Blanchard, Fabrice Guillet, and Henri Briand (IRIN, Polytech at Nantes, and University of Nantes, France) presented *the exploratory visualization for association rule rummaging.* The authors proposed to answer the association rule validation problem by designing visualization for the rule rummaging task. This new approach, based on a specific rummaging model, relied on interactive rule focusing and on rule quality measure.

## 3. CONCLUSION

In the open discussion, which concluded the workshop, the participants exchanged their opinions on the current trends, difficulties in extracting high-level (semantic) features and knowledge from multimedia data sets and noted the slow but steady progress in the field. Discussing the Workshop's organizational issues all participants expressed their strong non-satisfaction with the date when the Workshop has been held (the last day of the KDD Conference) and recommended never do this again.

Overall, the MDM/KDD2003 Workshop was a success. The opportunity for exchanging ideas and extending the research community in the multimedia data mining field was deeply appreciated. The strong commitment to continuing this event on an annual basis was expressed by all participants. The Workshop's information and selected papers can be found on the Web at http://research.it.uts.edu.au/emarkets/mdmkdd2003/.

## 4. ACKNOWLEDGMENTS

Gratitude is extended to the members of the MDM/KDD Workshop Committees for their effort in staging this annual event. The Workshop Program Committee is to be warmly commended for promptly providing the organizers with high quality paper reviews, and for assistance in the organization of the Workshop. The Members of MDM/KDD Workshop Committees and Co-Chairs thank the KDD-2003 Organizing Committee, General Chair Dr. Ted Senator and Workshop Chair Dr. Charu Aggarwal for their efforts to make the Workshop the reality.

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