

Executive Summary

Dagstuhl Seminar on Content-Based Retrieval

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Tim Crawford (Goldsmiths College - London, GB)

Remco Veltkamp (Utrecht University, NL)

Images, music, video, and 3D scenes play a crucial role in visual information systems and multimedia. There is an extraordinary number of applications of such systems in entertainment, business, art, engineering, and science. Such applications often involve huge collections of media, so that efficient and effective searching in databases of these media is an important operation.

The emphasis of the fourth seminar in this series lies on the PERCEPTUAL and COGNITIVE aspects of all kinds of content-based retrieval. Fundamental questions such as the role of perception and cognition in feature extraction, pattern similarity rating, indexing large collections etc. play an important role.

We strongly believe that content based retrieval needs an integrated approach from fields such as image processing, shape processing, psychology, database indexing, visualization, querying, etc. The purpose of this seminar is to bring together people from the various fields in order to promote information exchange and interaction among researchers who are interested in various aspects of accessing the content of images, music, video, and 3D data.

For this seminar, we have invited internationally known as well as young researchers from various disciplines with a common interest in content-based multimedia retrieval. We have been together with a group of 26 researchers for a week, away from the rest of the world, and certainly good interaction and exchange of ideas took place during the sessions as well as in the very "gemütliche" wine cellar, enjoying the cheese platter.

There was a total of 26 presentations, a demonstration session, and a discussion session. The discussion session was about the challenges we face in the coming phases of research in content-based retrieval; to a large extent this discussion was about common problems, especially in the difficulty of evaluation, across all the domains represented at this seminar – we hope that some common solutions will present themselves before too long. The presentations in this seminar can be grouped thematically as follows.

At a cross-media level, there were presentations about indexing and web issues:

- Ira Assent, RWTH Aachen, Efficient multi-step query processing for EMD-based similarity.
- Jeremy Pickens, FX Palo Alto Laboratory, Content-based Retrieval in a Web 2.0 World.
- Shankar Vembu, DFKI Kaiserslautern, Are we ready to embrace the semantic web?

On 3D model retrieval related topics:

- Ronen Basri, Weizmann Inst. – Rehovot, From pixels to semantics: methods for analysing image content.
- Simone Marini, CNR – Genova, Partial Matching by Structural Descriptors.
- Dietmar Saupe, Universität Konstanz, Visual Feature Space Analysis.
- Michela Spagnuolo, CNR - Genova 3D Shape Descriptions for Matching and Retrieval.
- Ayellet Tal, Technion – Haifa, Semantic-Oriented 3D Shape Retrieval using Relevance Feedback.

The presentations related to music retrieval were:

- Martijn Bosma, Utrecht University, Muugle: A Modular Music Information Retrieval Framework.
- Michael Casey, Goldsmiths College – London, Efficient Approximate Audio Matching by Hashing.
- Tim Crawford, Goldsmiths College – London, After the search is over ... the work begins (a narrative and discursive discussion of some adventures in musicology using a simple MIR system).
- Masataka Goto, AIST – Ibaraki, Musicream: Music Playback Interface for Streaming, Sticking, Sorting, and Recalling Musical Pieces.
- Frank Kurth, Universität Bonn, Some Principles for Constructing Robust and Semantically Meaningful Audio Features.
- Kjell Lemström, University of Helsinki, Geometric Algorithms for Transposition Invariant Content-Based Music Retrieval of Symbolically Encoded Music.
- Micheline Lesaffre, Ghent University, A user-oriented approach to Music Information retrieval.
- David Meredith, Goldsmiths College – London. Point-set algorithms for pattern discovery and pattern matching in music.
- Frans Wiering, Utrecht University, WITCHCRAFT: Melody retrieval in Dutch folksongs.

A number of presentations were on video and motion retrieval:

- Alan Hanjalic, Delft Univ. of Technology. Paradigm Shifts in Video Content Analysis Needed: The Why's and How's of Generic VCA Solutions.
- Stéphane Marchand-Maillet, CUI – Geneva, Indexing of video sequences: specific vs interactive processing.

- Chong-Wah Ngo, City University - Hong Kong. Discovery of Near-duplicate and Common Visual Concepts.
- Meinard Mueller, Universität Bonn. Automatic Classification and Retrieval of Motion Capture Data.
- Jan Van Gemert, University of Amsterdam. Robust Scene Categorization by Learning Image Statistics in Context

The other presentations were largely in the area of image retrieval:

- Rolf Lakaemper, Temple University – Philadelphia. Partial Shape Similarity Using Edge Groups Detected by Extended EM.
- Paul Rosin, Cardiff University. Cognitive Aspects of Computing Shape.
- Ludmila Scharf, FU Berlin. Probabilistic Algorithms for Matching Images.
- Remco Veltkamp, Utrecht University, Properties and Performances of Shape Similarity Measures.