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Editorial

Tutorial Issue on the MPEG-4 standard

After the great successes of the MPEG-1 and MPEG-2 standards which opened the digital frontiers to audiovisual information and allowed the deployment of high performance services, the Moving Pictures Experts Group (MPEG) is striking again with the emerging MPEG-4 standard. The MPEG-4 standard is the acknowledgement by MPEG, the leading standardization body in audiovisual representation technology, that the data models underpinning MPEG-1 and MPEG-2 were limited and could not fulfil the new needs of emerging multimedia applications, such as hyperlinking, interaction and natural and synthetic data integration. MPEG-4 is the answer to the requirements coming from the new ways in which audiovisual information is nowadays produced, delivered and consumed.

To reach this target, MPEG-4 follows an object-based representation approach where an audiovisual scene is coded as a composition of objects, natural as well as synthetic, providing the first powerful hybrid playground. The objective of MPEG-4 is thus to provide an audiovisual representation standard supporting new ways of communication, access, and interaction with digital audiovisual data, and offering a common technical solution to various service paradigms – telecommunications, broadcast, and interactive – between which the borders are disappearing. MPEG-4 shall supply an answer to the emerging needs of application fields such as video on the Internet, multimedia broadcasting, content-based audiovisual database access, games, audiovisual home editing, advanced audiovisual communications, notably over mobile networks, tele-shopping, and remote monitoring and control.

The main idea behind this Tutorial Issue is to gather a set of papers that accurately describe the various MPEG-4 tools in a way that is easily readable by non-MPEG members. Although the papers target MPEG-4 Version 1, MPEG-4 Version 2 is already foreseen. To be sure to fulfil the highest expectations, an excellent group of authors was called for. In fact the tutorial papers have been written by some of the people who, from the very beginning, shaped the MPEG-4 standard, chairing MPEG Sub-groups and Ad-Hoc Groups, editing the standard, actively participating in the discussions and contributing their technology, thoughts and ideas. To compensate their efforts, I sincerely hope that this Tutorial Issue will become a reference in terms of MPEG-4 bibliography.

In the paper "MPEG-4: Why, what, how and when?", Fernando Pereira gives an overview of the MPEG-4 motivations, achievements, processes and schedule. The paper provides a high level view over MPEG-4 before entering the more technical papers.

The Systems part of the MPEG-4 standard is addressed in three papers. The first paper, "MPEG-4 Systems: Overview" by Olivier Avaro et al., gives an overview on the overall MPEG-4 architecture as well as on the way that MPEG-4 approaches multiplexing, synchronization, scene description, interactivity, content description, and programmability issues. The second paper, "MPEG-4 Systems: Elementary stream management" by Carsten Herpel and Alexandros Eleftheriadis, describes the elementary stream management facilities provided by MPEG-4 Systems which play a critical role in joining several building blocks together, e.g. the streaming resources to the audiovisual scene. Finally, the paper "MPEG-4's binary format for scene description" by Julien Signès et al. addresses MPEG-4 BIFS which is the MPEG-4 compressed format in which scenes are defined and modified.

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The paper "The delivery layer in MPEG-4" by Guido Francheschini introduces MPEG-4 DMIF which is the part of the standard abstracting media representation from the delivery technology. The paper presents DMIF motivations and architecture, describes DMIF tools, and analyses some relevant delivery scenarios.

Following MPEG tradition, media coding is a major MPEG-4 topic, and for the first time natural and synthetic content, audio and visual, are considered. The paper "MPEG-4 natural video coding: An overview" by Touradj Ebrahimi and Caspar Horne addresses the coding of video data, including many new coding tools, notably shape coding to consider arbitrarily shaped video objects. In a complementary paper, entitled "Face and 2-D mesh animation in MPEG-4", A. Murat Tekalp and Jörn Ostermann address the coding of synthetic visual objects, notably 3D faces and 2D meshes. Regarding audio data, Karlheinz Brandenburg et al. present in the paper "MPEG-4 natural audio coding" the MPEG-4 coding tools for natural audio and speech. In the same way, Eric Scheirer et al. present in the paper "Synthetic and SNHC audio in MPEG-4" the MPEG-4 coding tools for synthetic and SNHC audio.

To close this issue, Rob Koenen, the chairman of the MPEG Requirements Sub-group, addresses in his paper entitled "Profiles and levels in MPEG-4: Approach and overview" the MPEG-4 profiling strategy and specification which guarantee that the standard can provide adequate solutions for everyone's needs.

Finally some acknowledgements: first my most sincere appreciation to the authors, who accepted to spend part of their precious time working on this issue, even though MPEG was already taking too much time of their lives. Also my appreciation to the reviewers who embraced the task of improving the initial versions of the papers. Their efforts were essential to achieve the high-quality papers that we now have in this Tutorial Issue. Because they deserve public acknowledgement here go their names: Guido Franceschini, Michael Stepping, Javier Zamora, Reinhard Bayer, Paul Christ, Ganesh Rajan, Gabriel Abrantes, Roberto Pockaj, Davide Rocchesso, Scott Levine, John Lazzaro, Jörn Ostermann, Olle Franceschi, Mike Zeug, Kevin O'Connell, Paulo Nunes, Paulo Correia, Laura Contin, Jens-Rainer Ohm and Fernando Pereira.

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