Networked digital media

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Telecommunication systems have gone through tremendous changes in the past few decades and gained a special place in our daily lives at work and at home. This has been possible, among others, thanks to the Open Systems Inter-connect (OSI) model by International Standardization Orga-nization, which provides a simple, structured, and flexible abstract model to represent complex telecommunication systems by dividing them into seven layers and their inter-faces. Although, this approach has been instrumental in definition of basic architecture and components in telecom-munications, it has at the same time compartmented prob-lems into rather isolated islands, which at best take into account some considerations of their neighboring layers in their design for solutions in each layer. With recent progress of user-centric, dependable, and secure multimedia commu-nications and the maturity of the OSI to cope with multime-dia solutions and services, it is time to revisit this fundamental way of looking into telecommunication sys-tems and to seek for a more holistic and end-to-end archi-tectures that go beyond the limitations of OSI model.

This special issue is an attempt in this direction. The special issue is composed of a number of papers introducing end-to-end content delivery and management approaches that can better cope with requirements of networked media

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of tomorrow. In addition, the special issue exhibits a number of original papers reporting advances in security and media processing in form of tools and components necessary to cope with other needed requirements in the fast-moving field of networked media.

1 End-to-end delivery and architectures for multimedia content

The paper by António Pedro Inácio, Rui Santos Cruz, and Mário Serafim Nunes, entitled "Quality user experience in advanced IP video services" describes a model that corre-lates Quality of Service parameters and Quality of Experi-ence factors with impact on the variation of users' perception of the quality. An extensive set of subjective assessment experiments relying on 40 subjects and over 140 content was carried out. A detailed analysis concluded that all factors considered in the model have a significant impact on the perceived quality by the human subject. An implementation of the model by linear regression demon-strated very encouraging results with an accuracy of 99 %. This model can be considered a new no-reference metric to infer the perceived quality, applicable in many contexts, but essentially as a tool for service providers to estimate the rank customers may give to a content.

In the paper "Optimized dynamic compilation of data-flow representations for multimedia applications" by Jérôme Gorin, Mickaël Raulet, and Françoise Prêteux, two optimi-zation methods based on dataflow representations and dy-namic compilation are proposed that enhance flexibility and performance of multimedia applications. Both methods are particularly attractive in an adaptive decoding context, where decoders have the ability to adapt their decoding processes according to a given bitstream. This is achieved by using dataflow representations from the upcoming MPEG Reconfigurable Media Coding standard to supply

the decoding information to adaptive decoders. The first optimization takes benefits of the reuse of coding tools to reduce the time to obtain and configure enforceable decoders. The second provides an efficient, dynamic, and scalable execution according to the features of the execution platform. Implementation of these optimization techniques in two decoder representations compliant with the MPEG-4 part 2 Simple Profile standard and the MPEG-4 Advanced Video Coding standard shows that configuration time can be reduced by a factor of 3 and the performance of decoders can be increased by 50 %.

In the paper entitled "Multi-criteria decision algorithms for efficient content delivery in content networks", Andrzej Beben, Jordi Mongay Batalla, Wei Koong Chai, and Jaroslaw Sliwinski propose and evaluate a multicriteria decision algorithm for efficient content delivery applicable for content networks in general and in particular for content delivery networks and information-centric networking, which are part of the ecosystem in content distribution over internet. Their algorithm computes the best available source and path for serving content requests taking into account information about content transfer requirements, location of the consumer, location of available content servers, content server load, and content delivery paths between content servers and consumer. In a first level, the proposed approach discovers multiple content delivery paths and gathers their respective transfer characteristics, based on long-term network measurements and performed offline. A second process is then invoked for each content request to find the best combined content server and delivery path. The cooperation between both levels allows to increase the number of satisfied content requests thanks to efficient use of network and server resources. The proposed decision algorithm is evaluated by simulation using internet-scale network model. The results confirm the effectiveness gain of content network architectures that introduce network awareness.

"Internet-scale content mediation in information-centric networks" authored by George Pavlou, Ning Wang, Wei Koong Chai, and Ioannis Psaras departs from the fact that the vast majority of internet interactions relate to content access and delivery and that recent research has pointed to a potential paradigm shift from the current host-centric internet model to an information-centric one. The paper presents an internet-scale mediation approach for content access and delivery that supports content and network mediation. Content characteristics, server load, and network distance are taken into account in order to locate the best content copy and optimize network utilization while maximizing the user quality of experience. The content mediation infrastructure is provided by ISPs in a cooperative fashion, with both decoupled/two-phase and coupled/one-phase modes of operation.

2 Network security tools and applications

The paper "Unifying running-key approach and logistic map to generate enciphering sequences" by Adriana Vlad, Azeen Ilyas, and Adrian Luca presents a new approach to generating enciphering sequences useful in information protection and illustrates this general concept on images. The proposed procedure in then both theoretically and experimentally implemented by combining selected elements from running key cipher, information theory, and statistics. The enciphering key generator is based on the logistic map, and its theoretical properties are demonstrated by statistical tests. Although the main application in the paper is around images, the concept is rich enough to be easily and in a straightforward manner applied to other types of multimedia content and can be used in a large spectrum of secure media communication systems, products, and applications.

"Cinematography sequences tracking by means of fingerprinting techniques" authored by Adriana Garboan, Mihai Mitrea, and Françoise Prêteux introduces a security tool for video fingerprinting in order to uniquely identify a visual content and its replicas. A new robust fingerprinting method is proposed to cope with the challenge of designing an enabler for the use of internet as a distribution tool in cinematography. The tools is based on 2D wavelet transform and addresses two use cases, namely, retrieval of video content from a database and tracking of in-theater camcorder-recorded video content. Results show that in the first use case, the probability of false alarm and missed detection below 0.0005 are achieved with precision and recall values larger than 0.97 while in the second use case, the probability of false alarm can reach as low as 0.00009, for a probability of missed detection below 0.0036, and precision and recall of 0.72.

3 Media processing

In "Feed and fly control of visual scanpaths for foveation image processing", Giuseppe Boccignone and Mario Ferraro observe that although foveation-based processing and communication systems can exploit a more efficient representation of images and video by removing or reducing visual information redundancy, one point that is neglected by the great majority of foveation models is the "noisy" variation of the random visual exploration exhibited by different observers when viewing the same scene, or even by the same subject along different trials. They then propose a model for the generation and control of scanpaths that accounts to overcome such limitations. In the model, the sequence of fixations and gaze shifts is controlled by a saliency-based, information foraging mechanism implemented through a dynamical system switching between two

states, "Feed" and "Fly". Results of the simulations are then compared with experimental data derived from publicly available datasets.

"A robust invariant bipolar representation for R^3 surfaces: applied to the face description" by Faouzi Ghorbel and Majdi Jribi introduces a novel invariant curved surface representation under the 3D motion group, constructed from the superposition of the two geodesic potentials generated from a given couple of surface points. Different numerical methods are then implemented in order to find an efficient approximation in the mean of the shape distance and inference of small distortions of points positions applied to the

reference points is analyzed. The proposed representation is further applied to real 3D images, where experimentations are performed on the 3D facial database Bosphorus to validate the feasibility of this approach.