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Author(s)	Antonio Navarro (IT), Yves Dhondt (IBBT), Rik Van de Walle (IBBT)

Abstract

This document, part of workpackage 7, is intended to report SUIT organization of workshop on audio-visual coding for convergent networks, particularly, DVB-T/H and WiMAX. This workshop has been organized as a special session of the IEEE International Conference on Consumer Electronics 2008 held in Vilamoura-Algarve on April 14-16, 2008.

Keyword list: Workshop/Special Session, Convergence.

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Workshop on DVB-T/H and WiMAX Convergence

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1 Introduction

The International Symposium on Consumer Electronics 2008 (ISCE 2008) is the 12th in the series that has been organized annually since 1997. It provides a forum for researchers, system developers, and service providers to share ideas, designs, and experiences on the emerging technologies related to consumer electronics.

This year, for the first time, the conference was co-located with a concertation meeting of the European Commission.

1.1 *Scope of the conference*

The following topics were in the scope of the conference:

- Automotive and Home Electronics: entertainment systems, navigation, personalization, control, PnP, protocols, hardware, software.
- Internet Applications: video, audio, telephone, internet technologies, home network, gateways, servers, remote access, e-commerce, security, mobility and convergence.
- Multimedia and Networking: PC/video convergence, multimedia databases, multimedia content description, hardware, software, interactive services, gaming, MHP, audio-visual networking, IPTV, P2P.
- Video Technology: Interactive TV, video coding, implementation/architectures of video standards, scalable video coding, distributed video coding, video transcoding and transmoding, still & video cameras, video/TV recording, 3DTV.
- Analogue & Digital Audio: Hi-Fi, speech, electronic hard copy, audio processing.
- Communications: Telecom & Broadcasting convergence, transmission standards (DRM, DVB, DAB, T-DMB, MediaFLO, etc) terrestrial, satellite, cable, mobile, home networks, wireless applications, portable devices, data broadcasting, channel coding, interleaving techniques, channel estimation and equalization.
- User and Human Interfaces: collaborative multimedia, interactive environments, content presentation, ergonomics, man-machine interface, ergonomic design.
- EMI/EMC: designing and testing for EMI/EMC compliance, CAE, field test results, equipment compatibility, high-speed digital design, PLC.
- Manufacturing and Green Design: clean manufacturing, disposal, recycling.
- Software Testing: reliability, robustness, embedded software.
- Other New Emerging Technologies: low power consumer devices, services, digital rights management.

1.2 *Invited talks*

The invited talks selected for this conference covered the different angles of consumer electronics.

The following invited talks were held at ISCE2008:

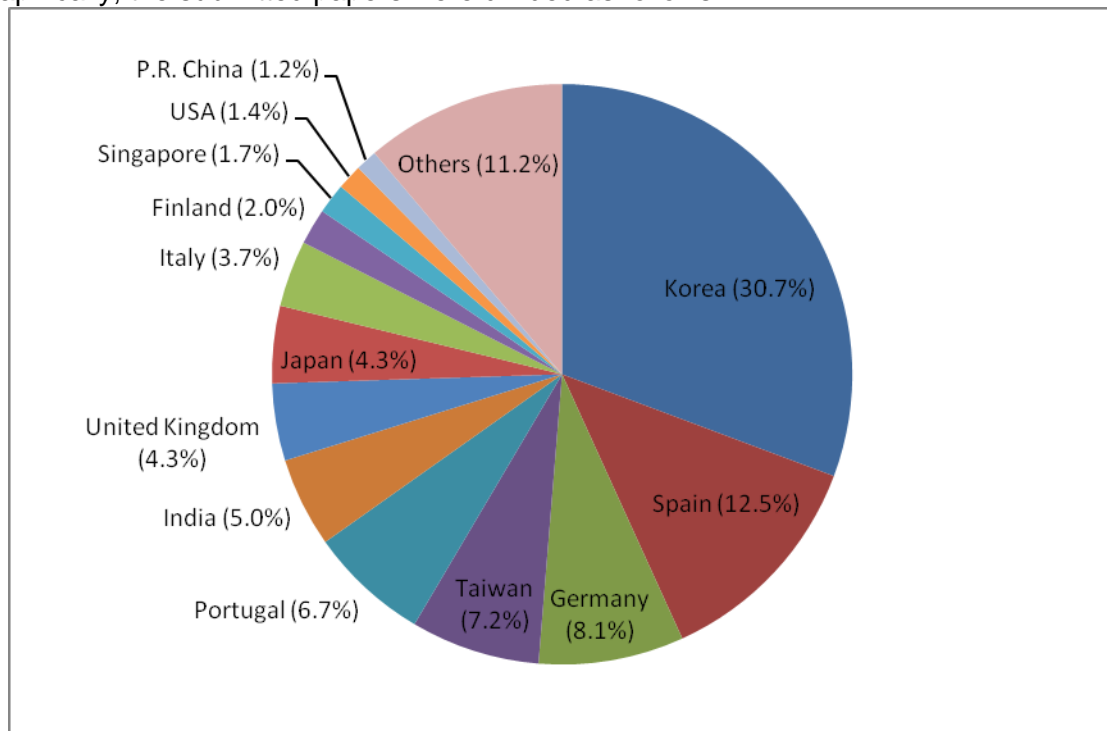
- Distributed Video Compression: Basic, Research Problems, Applications
by Christine Guillemot (INRIA, FR)
- Audio-Visual Human Computer Interface
by Tom Huang (University of Illinois, USA)
- Reconfigurable Video Coding (RVC): A new specification and implementation paradigm for MPEG codecs
by Marco Mattavelli (École Polytechnique Fédérale de Lausanne, CH)

- Improving JPEG Baseline Compression
by Joan Mitchell (Infoprint, USA)
- The Changing Landscape of Multimedia SoC Design
by Santanu Dutta (nVidia, USA)
- Trends and Future Research Priorities on networked Media
by Luis Rodriguez-Rosell (European Commission)

1.3 Impact of the conference

ISCE2008 received 322 papers for review of which 56% were accepted by the reviewers. This resulted in 44 sessions with a total of 180 accepted papers. The main topics of the conference were clearly communications and networking.

Geographically, the submitted papers were divided as follows:



2 Special session: Audio-Visual Coding for Convergent Networks

The development and deployment of the multimedia services and applications in convergent fixed and mobile environments requires the adopting of new techniques where both multimedia coding, transmission and networking issues are addressed jointly. The efficient delivery mechanisms of multimedia applications and services over emerging diverse and heterogeneous fixed and wireless networks are a challenging research objective. The recent research efforts, like WiMAX, DVB-xx and 3G LTE include some support for interworking among heterogeneous technologies to achieve multimedia session continuity. Future multimedia networks like peer-to-peer will pose new challenges at the multimedia coding layer as well as on the interoperability at the transport and network protocols and radio access layers. This special session was mainly looking for audio and video coding algorithms suitable for convergent networks being them in serial or in parallel from a source (e.g. a server) to a sink (e.g. an user terminal).

Original unpublished contributions were solicited in the following topics (but are not limited to):

- Scalable coding of multimedia in a parallel or serial of fixed, wireless and mobile networks
- Multimedia retrieval in convergent wireless and mobile environments
- Mechanisms supporting triple-play services in emerging convergent end-to-end networks
- Multiple description and distributed source coding in convergent environments
- Cross-layer optimization techniques for multimedia communications over convergent wireless networks
- Joint video source-channel coding
- Rate Control and adaptation for heterogeneous wireless networks
- Standard conversion and transcoding to support multimedia delivery over heterogeneous fixed and wireless networks
- P2P multimedia streaming in a chain/mesh of wireless and mobile networks

Note however that some of the topics for the special sessions are also in the scope of the other sessions of the conference. Therefore, the list of selected papers for the special session are not the only ones on those topics at ISCE 2008.

2.1 List of papers

The following list shows SUIT Special Session papers titles and abstracts:

11:20-12:40 – Room: Delfim - Special Session: Audio-visual Coding for Convergent Networks

1- Scalable Multiple Description Video Coding for Error-Resilient Transmission over Hybrid Networks

Maryse Stoufs (Vrije Universiteit Brussel, BE); Dirk Bakker (Vrije Universiteit Brussel, BE); Joeri Barbarien (Vrije Universiteit Brussel, BE); Adrian Munteanu (Vrije Universiteit Brussel, BE); Peter Schelkens (Vrije Universiteit Brussel, BE)

Abstract

In this paper a scalable multiple description video coding approach based on embedded multiple description scalar quantization (EMDSQ) is presented. The proposed approach enables the progressive transmission of video over unreliable channels with variable bandwidth. Experimental results show that in lossy transmission conditions the proposed embedded multiple description coding system yields better rate-distortion performance compared to single description video coding and can efficiently sustain 20% of losses.

Conclusions

In this paper a scalable multiple description video coding methodology based on EMDSQs was presented. The experiments clearly show the benefits of using multiple description coding to transmit video streams over errorprone channels and demonstrate that, at the same overall rate, a significant gain in average PSNR and in visual quality can be achieved by using two descriptions instead of one description to transmit the video sequence. Also, it is shown the proposed multiple description coding methodology can sustain 20% of packet losses without major degradation of the video quality.

2- Scalable Content Delivery Over P2P Convergent Networks

Theodore Zahariadis (Synelixis, GR); Federico Alvarez (Universidad Politecnica de Madrid, ES); Olimpiu Negru (Thomson, FR)

Abstract

This paper describes an innovative system and its architecture to offer media scalable content delivery, increasing the robustness and resiliency, enriching the PQoS both within the network and/or at the end-user terminal, while protecting the content from unauthorized access over heterogeneous physical architecture and P2P logical overlay network topologies. The system is focused on different convergent networks including broadcasting, interactive/on demand bidirectional networks and mobile networks, and mesh P2P logical overlay topologies. This system is based on three technology pillars: Multi-layered/Multi-viewed content coding, Multi-source/multi-network streaming & adaptation, content protection and lightweight asset management. In addition, the applicability to IPTV over P2P convergent networks is described to demonstrate the system usefulness to offer commercial services.

Conclusions

This paper introduces a novel approach to the architectures for seamless content delivery in convergent networks involving heterogeneous devices. This architecture has a clear applicability to IPTV services based on P2P logical overlay network topologies. Although the paper describes a theoretical approach to the problem, the architecture is being implemented (see [4]) and the technologies described in the paper are expected to be developed for a complete end-to-end system functionality to be tested in a P2P environment (PlanetLab). This implementation and experimentation will offer a full validation for a commercial exploitation of the proposed solution.

3- Delivery of SVC/MDC streams over Wimax and DVB-T networks

Victor Domingo (Ramon Llull University, ES); Francesc Enrich (Ramon Llull University, ES); Francesc Pinyol (Ramon Llull University, ES); Gabriel Fernandez Ubiergo (Ramon Llull University, La Salle School of Engineering, ES)

Abstract

This paper introduces an approach for the optimal delivery (encapsulation and signalling) of video streams coded using H.264 Scalable Video Coding (SVC) combined with Multiple Description Coding (MDC). The solution presented uses optimization and control strategies depending on the

different type of delivered services, the terminals that will consume these services, the load process of the video servers and the network conditions.

Conclusions

As conclusion, in this paper the study of the appropriate RTP encapsulation/synchronization process is one step forward to ensure the correct process and delivery of the video information to the consumers providing the best quality of services. By this way, it is possible to avoid undesirable frame delays and packet losses inserted by the heterogeneous nature of the transport chain. It is also important to emphasise the benefits of using an intelligent playout to maximise the use of the total bandwidth of the system, taking advantage of the scalability features of H.264 SVC video, allowing the optimization of the bit rates.

4- Mobile HDTV at 140 km/h

Nuno Coelho (University of Aveiro, PT), Nelson Cabral (University of Aveiro, PT), David Marques (Media Capital Technologies, PT) Antonio Navarro (University of Aveiro, PT)

Abstract

The digital era triggers new and ambitious services running on different platforms. Digital mobile systems provide a constrained quality communications, thereby, an acceptable quality is only ensured when the signal-to-noise ratio is above a certain limit and, even though, usually at a lower capacity than fixed systems. In this paper, we report a DVB-T measurement campaign at 730 MHz with an EIRP (Effective Isotropic Radiated Power) up to 100W. As far as we know, this is the first publication describing Radio-Frequency (RF) measurements as well as mobile HDTV subjective results at a high speed around 140 km/h. By mobile subjective (MS) results, it is meant, block, slice or frame losses resulting in visual artifacts. The correlation between MS measurements and RF measurements like receiving power, carrier-to-noise-ratio *and modulation error rate* is discussed in the paper. The paper ends by providing some recommendations namely, the minimum transmitting power and packet error rate (PER) to achieve visual artifact-free condition

Conclusions

Using 2k mode, even at lower power, the MS results are very good. In 5/6 code rate the number of visual defect detected during the field tests doubled for 8k mode. However, 300 mW in the power Amplifier was the minimum power to guarantee an acceptable quality at 140km/h. DVB-T has really coped with high mobility at least up to the maximum speed permitted in most of the worldwide countries.

3 Conclusions

Several conclusions came forward from the special session, as well from the conference in general. For example, there clearly is a market for both DVB-T and WiMAX. Hence the convergence of those networks will be an interesting research topic in the near future.

Also, from the presentations in the special sessions, people were made aware that DVB-T, although not originally intended, can cope very well with high mobility. Tests showed that, while driving 140 km/h, consumers can still receive video at acceptable quality.

It was also shown that, with the convergence of networks, multiple description coding becomes an interesting tool to provide high quality video to users. Even with 20% packet loss over both networks, the overall video quality was still acceptable for customers. One of the problems, synchronizing the coded video streams from both networks was also successfully tackled here.

Furthermore, at the conference, several interesting papers were presented related in some way to small parts of the SUIT architecture. However, the complete SUIT architecture, from broadcaster to consumer, tackling all the intermediary problems, is still something unique.