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MUSCADE Focus

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Special points of interest:

- MUSCADE Project Kicks off on January 26th.
- The position statement is on 3D multiview video coding.
- MUSCDE is represented at several events including CeBit 2010 and NAB 2010

Inside this issue:

Position Statement	1
EBU's 3DTV Study Group	1
MUSCADE Kicks off	4
Holografika at NAB2010	5
Concertation Meeting	5
HHI & KUK at CeBit 2010	5

3D Multiview Video Coding

Position Statement submitted by Erhan Ekmekcioglu of University of Surrey, UK

The current trend in 3D video services over existing communications infrastructure has necessitated efficient representation, compression and transport schemes for 3D video. Multi-view video, flexible in terms of data size, is the most common and well known format for 3D video communications, which is envisaged to be utilised in most 3D video services. Figure 1 shows an illustrative example for multi-view video composed of 8 camera views. Short term 3D video service solutions, that are based on stereoscopic video transmission, do not target extra bandwidth utilisation and extra video processing, but rely on visualising 3D video

with reduced resolution and less immersion. Nevertheless, it is inevitable that immersive 3D video services with full resolution, finer image details, improved parallax and wider scene navigation range will demand much more bandwidth than that is required for conventional 2D video. Compressing 3D multi-view video carefully and efficiently, without sacrificing image quality, can save more bandwidth and open space for the transmission of extra services and features related to 3D immersion.

The multi-view extension of MPEG-2 has been created and utilised (MPEG-2

Continued on page 2...

EBU Sets up a 3DTV Study Group

The EBU Technical Committee, which met last week at the premises of the ZDF, approved the formation of an EBU Study Group on 3DTV. The general aim of the group will be to allow EBU Members with an interest in 3DTV to find a focal point for information and experience exchange. In addition, common user requirements will be formulated, relevant to each part of the media value chain (production, distribution, and consumer), and communicated to the technical standards bodies such as DVB, ITU and SMPTE. It is assumed that the 3DTV Study Group will have its first meeting in March 2010.

EBU TECHNICAL is itself also involved in two EU

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3D Multiview Video Coding continued...

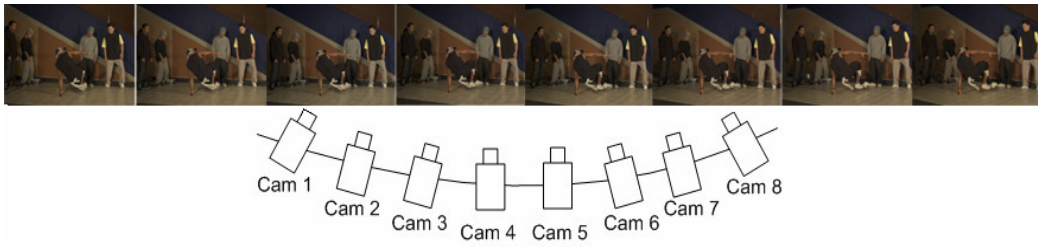

Figure 1. Sample Multiview video shot from Breakdancers [1] sequence

multi-view profile [2]) to encode the stereoscopic videos. This has not been widely exploited, due to its restricted compression efficiency, with respect to simulcast coding, and the lack of support for head motion parallax. Colour-plus-depth representation, which enables head-motion parallax unlike the conventional stereoscopic video, where the depth representation format is specified according to MPEG-part C [3-4], was created as a fully backward compatible and more compression efficient scheme. A stereoscopic video pair can be rendered using video plus per pixel depth value. The efficiency with respect to conventional stereo comes from the fact that the depth map can be successfully encoded at around 10%-20% of the bit-rate of the color video [5].

The specifications of MVC, an amendment of H.264/AVC, can be found in [6-7]. The main target has been to create a coding framework for multi-view videos that exploits the correlations existing within the same frame, frames of the same view and the frames of different views to the highest degree. Main research work has been in the exploration of convenient prediction structures [8-9], which include novel prediction sources (e.g. virtual references [10]), and the removal of inter-view illumination differences. The MVC standard aims to adhere to a number of constraints. These constraints include the decoding complexity, view random access, parallel (multi-thread) decoding, viewpoint scalability, etc. In general it is the case that these constraints tend to conflict with the rate-distortion performance of the overall multi-view coding scheme. It is therefore a great challenge to propose and implement coding architectures to optimize such trade-offs between the compression efficiency and other application specific constraints.

MPEG has recently formed a working group on the exploration of practical issues regarding Free-viewpoint TV (FTV) that is powerful in multi-view (more than stereo) applications. Current work is concentrated on improving and opening the way for standardizing two key processes that take place in FTV: depth estimation and view synthesis. These two processes may be considered dependant, since the performance of both parts affects each other. The compression issue is under consideration again in the context of multiple view plus per-view depth map (MVD). Compression experiments are being conducted to determine appropriate bit rates for evaluation and the impact on intermediate view generation quality with compressed depth maps. In addition, MPEG has initiated a new phase of standardization, which aims to be completed within the next couple of years. This phase of standardization considers a new 3D video framework that puts concrete limits on the video transmission bandwidth, as in conventional multi-view coding systems the necessary transmission bandwidth is proportional to the number of viewpoints. Due to limitations, the 3D Video (3DV) data format is planned to be based on limited camera inputs, but more views can be added. The key point is to generate (render) more number viewpoints to support a wide range of auto-stereoscopic displays. Moreover, the transmission rate should be fixed, i.e. the rate should not increase as the display requires a higher number of views. Accordingly, it is envisaged to decouple the range of viewpoints and the transmission bandwidth, where the bandwidth is constrained with physical condi-

"It is envisaged to decouple the range of viewpoints and the transmission bandwidth"

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3D Multiview Video Coding continued...

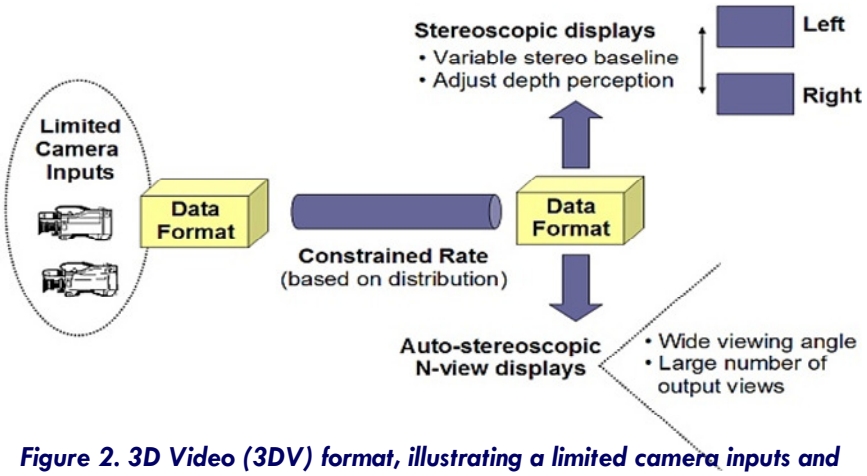

Figure 2. 3D Video (3DV) format, illustrating a limited camera inputs and constrained rate transmission case.

tions. The illustration of the proposed framework is shown in Figure 2 [11]. The proposed 3DV format is expected to improve the 3D rendering capabilities beyond color-plus-depth format, without requiring a substantial increase in the transmission bandwidth. In other words, the 3DV coding is expected to reduce the transmission bandwidth, compared to simulcast coding and MVC, but increase the bandwidth with respect to 2D and color-plus-depth coding, while not altering the 3D rendering capabilities. The rendering capabilities are expected to be as much as that of MVC and simulcast coding. The requirements are outlined in [12].

Built on top of the expertise gained in recent research works on 3D multi-view video compression, MUSCADE project aims to develop advanced multi-view video coding algorithms scalable in terms of network performances and display capabilities and robust against transmission channel distortions, and propose them to standard bodies. Especially, the envisaged workflow is proposed to be parallel with the concurrent MPEG activities on 3DV. These algorithms have the goal to split contents in several complementary sub-streams. The sub-streams are organized hierarchically so that most important ones are transmitted with a better error protection. One of the major concerns related to multimedia services, the real-time constraint, is also addressed in the scalable and robust multi-view coding framework proposed by MUSCADE. The limits on the encoding speed and its reflections on the overall rate-distortion performance and more importantly on the perceived 3D video quality are subject to investigation within MUSCADE.

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"The proposed 3DV format is expected to improve the 3D rendering capabilities beyond colour-plus-depth format"

MUSCADE Kicks off in Toulouse...

The MUSCADE Kick-off meeting took place at Astrium's site in Toulouse, France on 27 and 28 January 2010. Representatives from all 12 consortium parties attended the Kick-off meeting which included administrative, contractual and technical discussions. The attendees also visited Astrium satellite integration facilities. On 28th January, the first Executive Board meeting, including all work package leaders, was held.

"Representatives from all 12 consortium parties attended the Kick-off meeting"

Submitted by: EADS Astrium

EBU Sets up a 3DTV Study Group

Continued from page 1...

funded projects - MUSCADE and 3D-VIVANT. MUSCADE is targeting the use of multi-camera 3D and signal distribution to the home for various types of 3D display devices. 3D-VIVANT will research so-called 'holoscopic' camera and display systems. Taken together, the 3DTV Study Group, and the two EU projects will ensure that EBU TECHNICAL can adequately represent the EBU Members' requirements at the forefront on 3D technology developments.

Submitted by: EBU

Future Computer Monitors that are 3D enabled...

MUSCADE is represented at the Concertation Meeting

The MUSCADE project manager Guillaume Berenger from Astrium Satellites attended the 5th FP7 Networked Media Concertation Meeting in Brussels on 3-4 February 2010. Details of the meeting can be found at the Commission Website:

http://cordis.europa.eu/fp7/ict/netmedia/concertation/0210_en.html

During this meeting, he gave a short presentation to introduce MUSCADE to all attendees, and outline its objectives in detail. This brief presentation was well received by the audience, as it provided the opportunity to clearly identify the project objectives. On 4 February, four clusters also met in parallel: User Centric Media, Media Delivery Platforms, A/V search and 3D Media. Guillaume Berenger attended the cluster meeting on 3D media where 3D-related project representatives have reported about work undertaken in their projects.

Submitted by:
EADS Astrium

MUSCADE to feature at NAB 2010

"3D 10 Years Hence: 20/20 in 2020?"

NAB 2010, Digital Cinema Summit, April 10-15, 2010, Las Vegas, USA. NAB / SMPTE Session on future of 3D:

MUSCADE will be present at the NAB / SMPTE session on "3D 10 Years Hence: 20/20 in 2020?", which will be organised by Hans Hoffmann of EBU. Tibor Balogh of Holografika and Aljoscha Smolic of Disney Research Zurich will be among the speakers. The session will look at questions such as: "What does the time-line look like for the migration from special purpose glasses to inexpensive (almost disposable) glasses to glassless technologies? What technical or standards barriers need to be overcome to ensure consumer acceptance and the start of significant sales?" The event will let us introduce our results to US professionals, who will also be interested in our plans and ongoing work in MUSCADE that go far beyond the state of the art in 3D capture, transmission and display.

Submitted by:
Holografika

" What technical or standards barriers need to be overcome to ensure consumer acceptance "

3DTV to showcase at CeBit 2010

MUSCADE was represented at this year's CeBIT event by Fraunhofer HHI and KUK Filmproduktion, which took place in Hannover, Germany on March 02-06, 2010. At the Fraunhofer's CeBIT Booth in Hall 9, Booth B36, researchers presented technologies and standards for 3D cinema and 3D television. As a special bonus, the transmitting of the Fraunhofer press conference was performed live in 3D, directly from the booth.

The press meeting took place on Tuesday, March 2, 2010. Discussion panelists included Prof.

Continued on page 6...

3DTV to showcase at CeBit 2010 continued from page 5...

Hans-Jörg Bullinger, President of the Fraunhofer-Gesellschaft and Josef Kluger, managing director of KUK Filmproduktion GmbH.

The Fraunhofer 3D Live Studio comprised a 3D camera rig equipped with microHD cameras and STAN stereoscopic analyzer, a helpful tool for the recording and transmission of three dimensional data in real-time. STAN stereoscopic analyzer that HHI jointly developed with KUK Filmproduktion is a combination of hardware and software that records and analyzes stereo images so that they can be processed in real time. Integration with a production studio and distribution of 3D data over the Internet with H.264 real-time coding also formed a part of the scenario. These technologies were developed in the PRIME project on Production and Projection Techniques for Immersive Media funded by the German Federal Ministry of Economics and Technology.

Submitted by:
KUK Filmproduktion

Project Management Office

EADS Astrium
Telecom Systems Department
31 rue des cosmonautes
31402 Toulouse
France

Phone: +33 562 196 364
Fax: +33 662 199 494
E-mail: greet.verelst@astrium.eads.net
Web: **www.muscade.eu**

Newsletter Editor

University of Surrey

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MUltimedia SCAlable 3D for Europe