INTERNATIONAL ORGANISATION FOR STANDARDISATION
ORGANISATION INTERNATIONALE DE NORMALISATION
ISO/IEC JTC1/SC29/WG11
CODING OF MOVING PICTURES AND AUDIO

ISO/IEC JTC1/SC29/WG11 MPEG2015/M35846
February 2015, Geneva, Switzerland

Source **Poznań University of Technology**
Chair of Multimedia Telecommunications and Microelectronics

Status **Contribution**

Title **Poznan University of Technology test multiview video sequences acquired with circular camera arrangement – "Poznan Team" and "Poznan Blocks" sequences**

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1 Introduction

During 106th to 110th MPEG meetings, the Ad-hoc Group on Free Viewpoint Television has identified a need for new, high quality 3D video test material corresponding to Free-Viewpoint Television (FTV) applications [1]. Poznań University of Technology has responded to such needs with the development of a video acquisition system with circular camera arrangement. This unique system was built by the authors, and was used in order to record test sequences that are suitable for experiments related to Free-Viewpoint television.

This document provides a common description of two test sequences produced by Poznań University of Technology, Chair of Multimedia Telecommunications and Microelectronics, Poznań, Poland. These sequences are "Poznan Blocks" and "Poznan Team". Firstly, the test sequence "Poznan Blocks" was acquired as already described in [2]. Now, we add a new test sequence called "Poznan Team" and depth information for both of those sequences. The presented test material is provided to MPEG (and the scientific community in general) for research and standards development purposes under the conditions mentioned in Section 5.

2 Wireless multi-camera acquisition system

The sequences have been recorded with the use of 10 Full-HD cameras placed on an arc around the scene. The cameras have been mounted on special wireless mobile camera units (Fig. 1) developed at Poznań University of Technology. Each mobile camera unit is equipped with:

- high resolution digital camera (Canon XH G1),
- power supply (battery),
- wireless synchronization receiver (Fig. 2),
- remote control receiver,
- HDD recorder (with Seagate Momentus 500GB disks).

Each camera module is able to record about 30 minutes of high resolution video. All cameras are precisely synchronized with the use of a wireless dedicated 869 MHz link. Each captured frame is signed with a time-code for error resilience. This also allows for detection of miss-synchronization. All cameras can be controlled by a dedicated systems that also uses a separate WiFi wireless link.

The usage of such camera modules is compliant with the strategy aimed at development of practical low-cost Free-Viewpoint Television system that could be used within 2-3 years [4,5]. The camera modules have been developed in order to demonstrate that an FTV camera system may be easily developed even using existing technology.

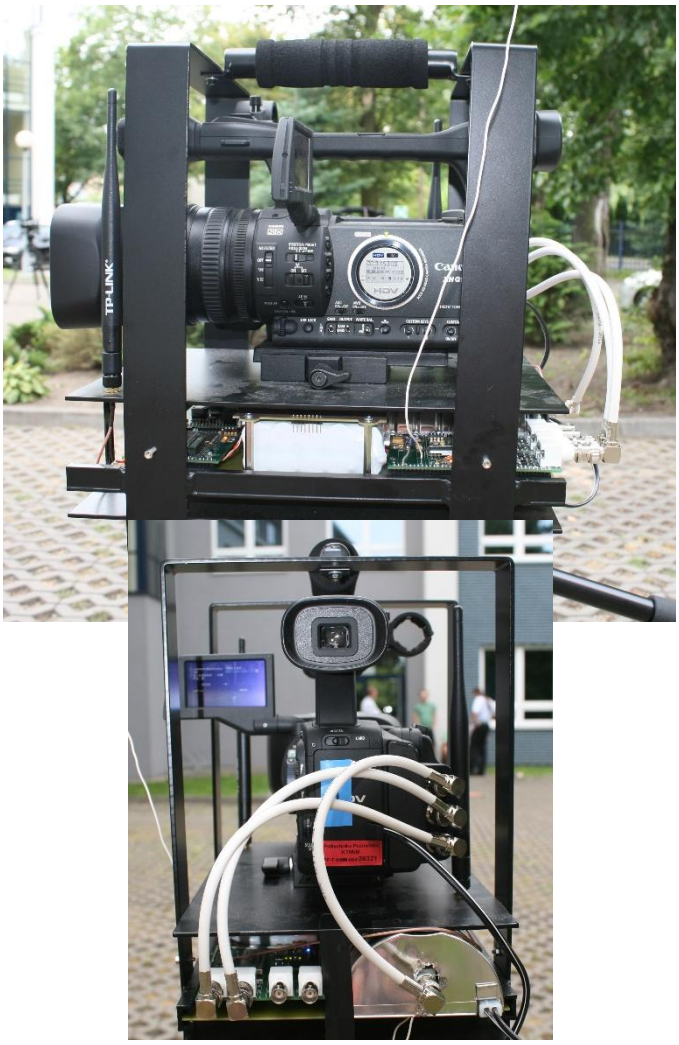

Figure 1. Wireless mobile camera module (side and rear views).

Figure 2. Wireless synchronization module.

The test video sequences have been recorded using the camera arrangement depicted in Fig. 3. The system may be easily used both outdoor (Fig. 4) and indoor (Fig. 5).

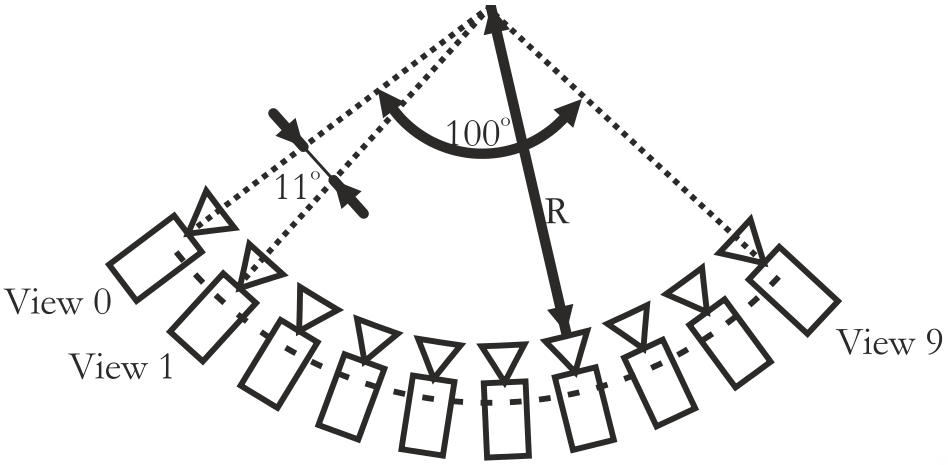

Figure 3. Circular camera setup used in the experiments reported in this documet.

Figure 4. Multi-camera setup used in production of “Poznan Team” test sequence.

Figure 5. Multi-camera setup used in production of “Poznan Blocks” test sequence.

3 Test sequence specification

The “Poznan Blocks” sequence was recorded inside the building with artificial lighting. It presents two persons playing with bricks on a table (Fig. 6).

The “Poznan Team” sequence was recorded outside the building in daily sunlight. It presents the team of Chair of Multimedia Telecommunications and Microelectronics while walking on the courtyard near the car park (Fig. 7).

In both cases, ten cameras were placed on an arc with radius of R meters (Fig. 3). The camera setup radius was set to R = 3 meters for “Poznan Blocks” sequence and R = 15 meters for “Poznan Team” sequence.

Resolution:	1920x1080 - Full HD
Frame rate:	25 frames per second
Number of views:	10
Camera arrangement:	about 100 degree of the circle around the scene
Length:	1000 frames (40 seconds)

Recorded sequences were precisely calibrated. Radial distortion of the lenses has been removed. All views have been color-calibrated. Intrinsic and extrinsic camera parameters for each of the camera are provided along with the sequence.

Figure 6. Exemplary frames from “Poznan Blocks” sequence.

Figure 7. Exemplary frames from “Poznan Team” sequence.

4 Depth maps

The depth data is provided along with the videos. The depth maps (Figs. 8 and 9) were algorithmically estimated from the videos. The estimation has been done fully-automatically with the use of in-house propriety depth estimation algorithm. In contrast to Depth Estimation Reference Software [3], where depth for only a single view is estimated at once, our estimation technique can estimate depth maps for all of the views. For that, all of the input views are used at once. This allows higher depth quality and reduces estimation time. Also, higher degree of inter-view depth consistency is attained.

Figure 8. Exemplary depth frames from "Poznan Blocks" sequence.

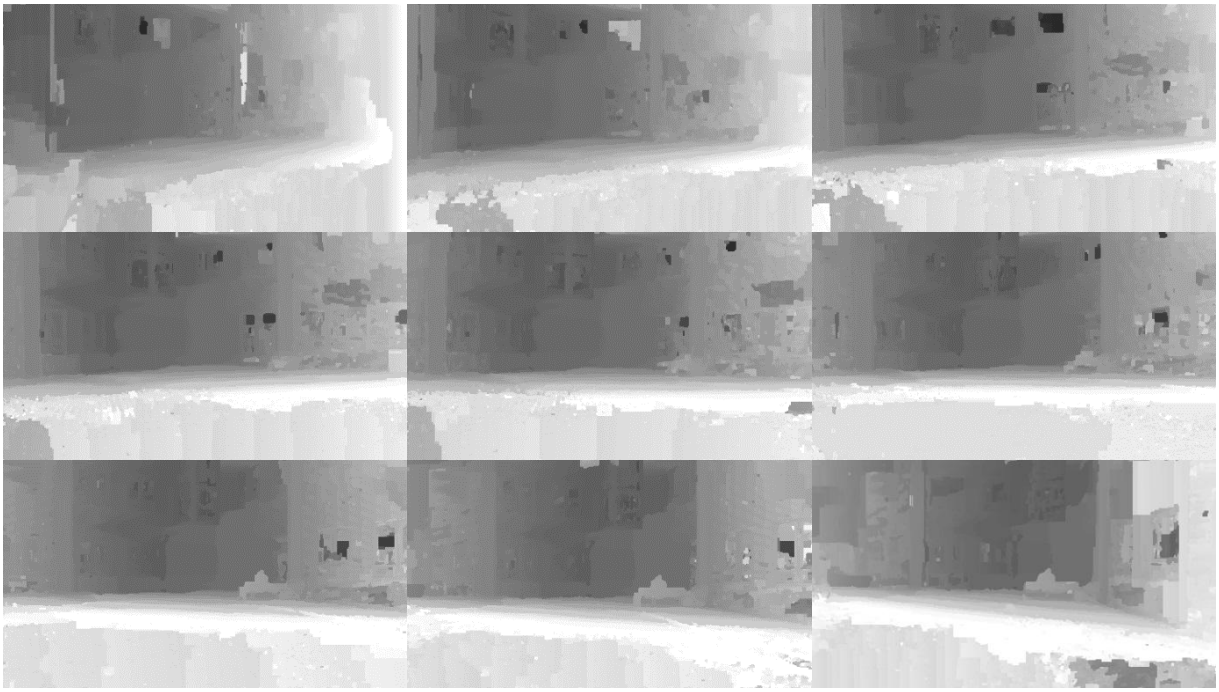

Figure 9. Exemplary depth frames from "Poznan Team" sequence.

5 Availability

The sequences remain the property of Poznan University of Technology but they are licensed for free use within ISO/IEC JTC1/SC29/WG11 (MPEG) for the purposes of research and development of standards. These sequences can be also freely used for research purposes outside MPEG as well. Any other use is prohibited unless an explicit permission is given by Poznań University of Technology, Chair of Multimedia Telecommunications and Microelectronics.

Acknowledgements are appreciated if the material was used in research and are **required if the material is to be used in publications.** The acknowledgement should use the reference to this document.

The abovementioned video sequences are available at ***ftp://multimedia.edu.pl/ftv*** ftp server. User credential will be provided upon request (see email to the authors).

6 Acknowledgement

The work was supported by National Science Centre, Poland, according to the decision DEC-2012/05/B/ST7/01279.

7 References

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[3] K. Wegner, O. Stankiewicz, M. Tanimoto, M. Domański, „Enhanced Depth Estimation Reference Software (DERS) for Free-viewpoint Television", ISO/IEC JTC1/SC29/WG11 MPEG2013/M31518, Geneva, Switzerland, October 2013.

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[5] M. Domański, A. Dziembowski, A. Kuehn, M. Kurc, A. Łuczak, D.Mieloch, J. Siast, O. Stankiewicz, K. Wegner, "Experiments on acquisition and processing of video for free-viewpoint television",3DTV-CON, Budapest 2014.