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Title **360 degree test image with depth**
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1. Introduction

MPEG is currently working towards supporting full immersion with 6DoF. In one of the previous documents [1] we have shown that it is possible to render additional omnidirectional view of the scene from monoscopic or stereoscopic omnidirectional video accompanied by omnidirectional depth. Currently limiting factor is lack of high quality content with depth maps available.
This documents presents a 3D model of entrance hall of building of Poznan University of Technology, which can be used to render synthetic omnidirectional content. The ability to directly render reference viewpoint in any place in the 3D space allows evaluation of depth estimation + view synthesis pipeline

2. Poznan Hall 360

2.1. Scene description

Scene presents entrance hall of Faculty of Electronics and Telecommunications of Poznan University of Technology.

Main omnidirectional camera is placed in the middle of the all, allowing the user to look around. Additional omnidirectional camera is placed to the left and right of the main camera.

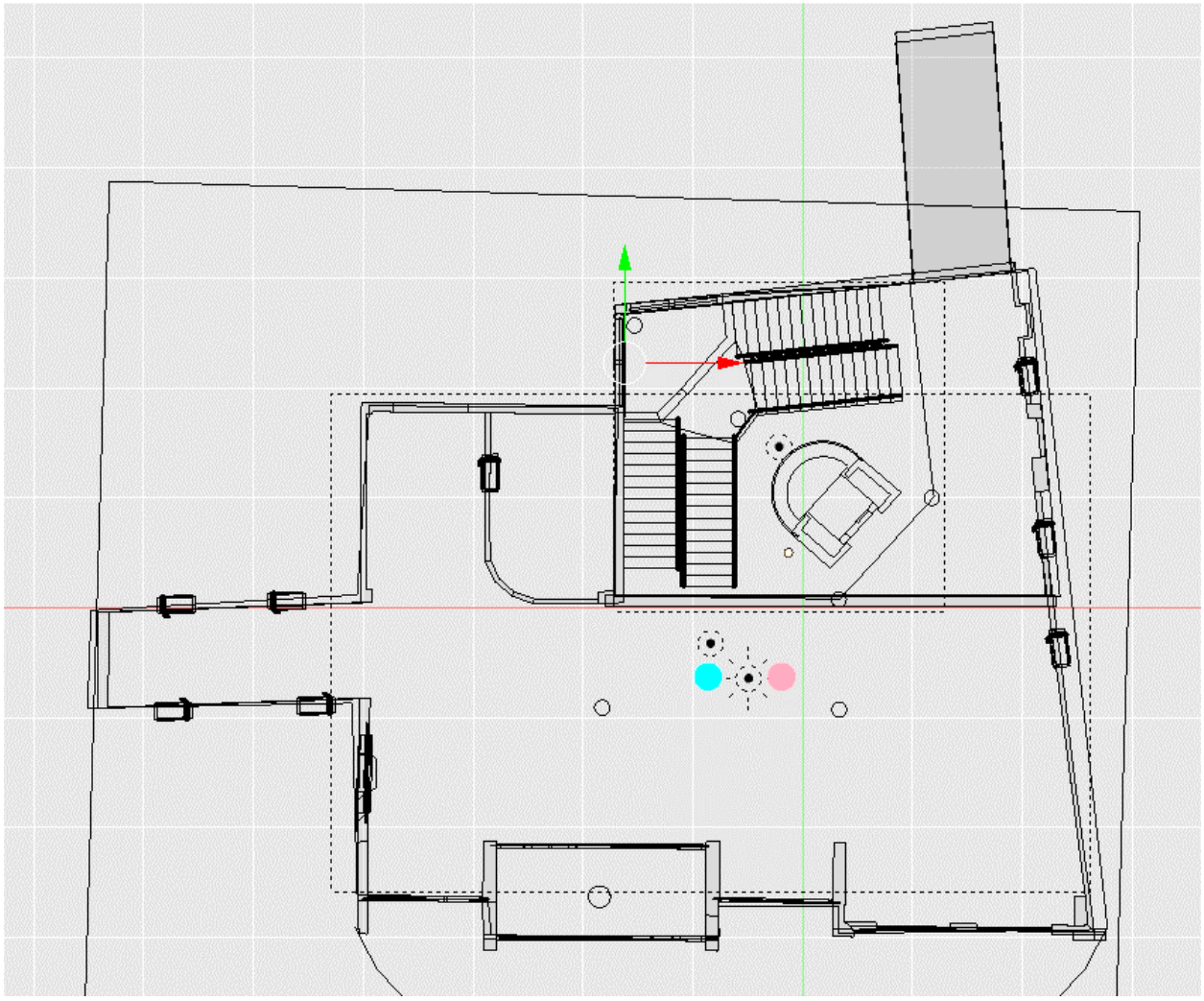

Figure 1. Overview of the camera positioning in “Poznan Hall 360” scene.

2.1. Depth map rendering

There are many depth map formats possible. Some of them have been standardized are used with in MPEG [2].
Rendering engines commonly uses z-buffer with is a form of z-distance depth map. Where distance to the pixel is stored directly.

Most of the MPEG software uses normalized disparity format where z-distance is stored as disparity formalized to a range from nearest distance Z_{near} to the farast Z_{far}. Relation of z-distance and normalized disparity stored in depth map is expressed as:

$$v = \frac{\frac{1}{Z} - \frac{1}{Z_{far}}}{\frac{1}{Z_{near}} - \frac{1}{Z_{far}}} \cdot v_{max}$$

In order to render depth map for our scene, and store it as normalized disparity map we have used Node editor and implement directly conversion from z-buffer to required format.

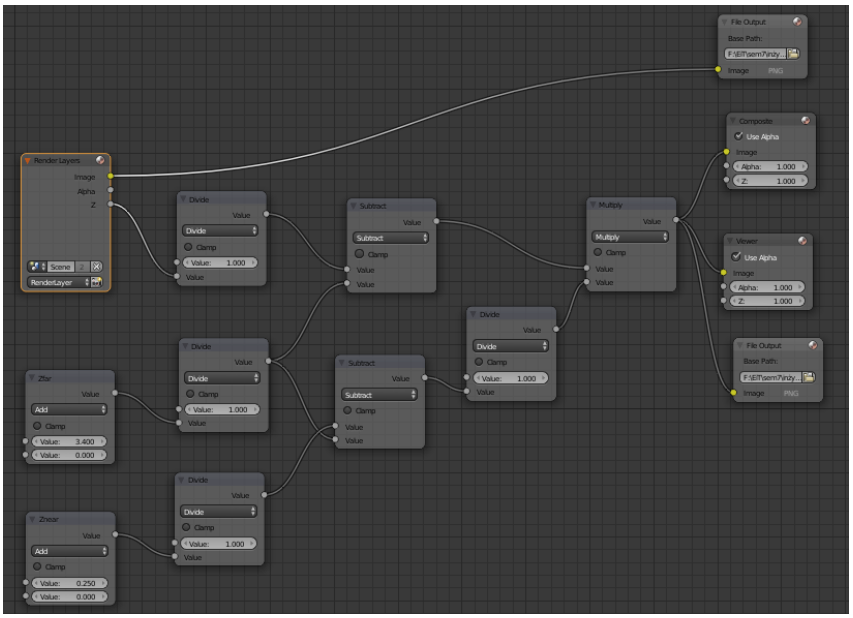

Figure 2. Node graph of a depth map rendering.

It is crucial to turn off all color processing, like white balancing as it may change value of rendered depth before storage in depth file.

2.1. Projection format used

All omnidirectional cameras are configured to render images and depth maps in equirectangular projection (ERP) format. The ERP format is the most widely used projection format for representing 360 degree video as a rectangular video. It is the default projection format used by JVET [5].

2.1. Resolution

We have provided rendered images and depth maps in two resolutions:

- 2048x1024,
- 8196x4096.

Images with other resolution can be rendered out of the provided source blender file.

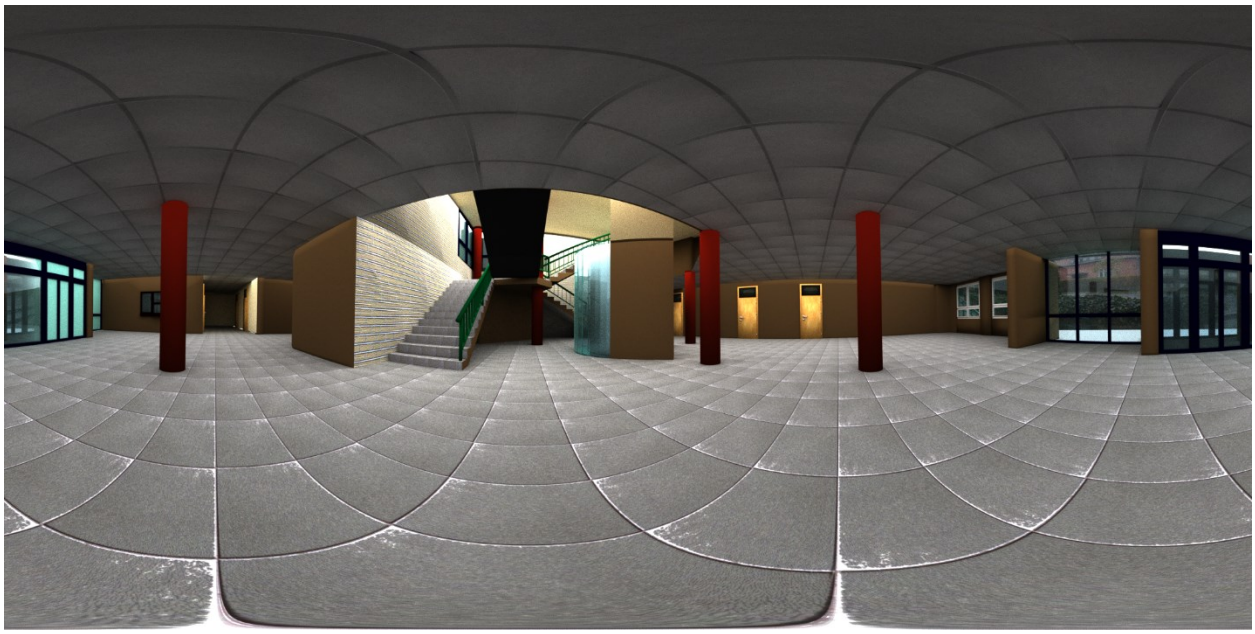

Figure 3. Example frame of rendered Omnidirectional view of the proposed “Poznan Hall 360” scene.

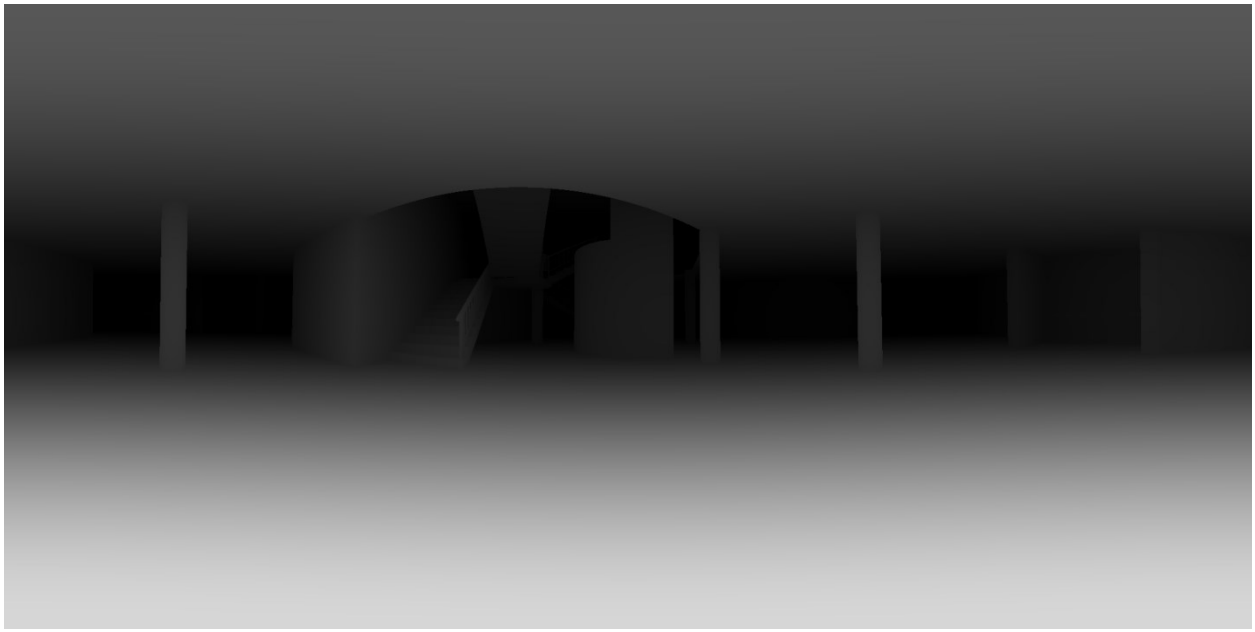

Figure 4. Example frame of rendered omnidirectional depth map of the proposed “Poznan Hall 360” scene

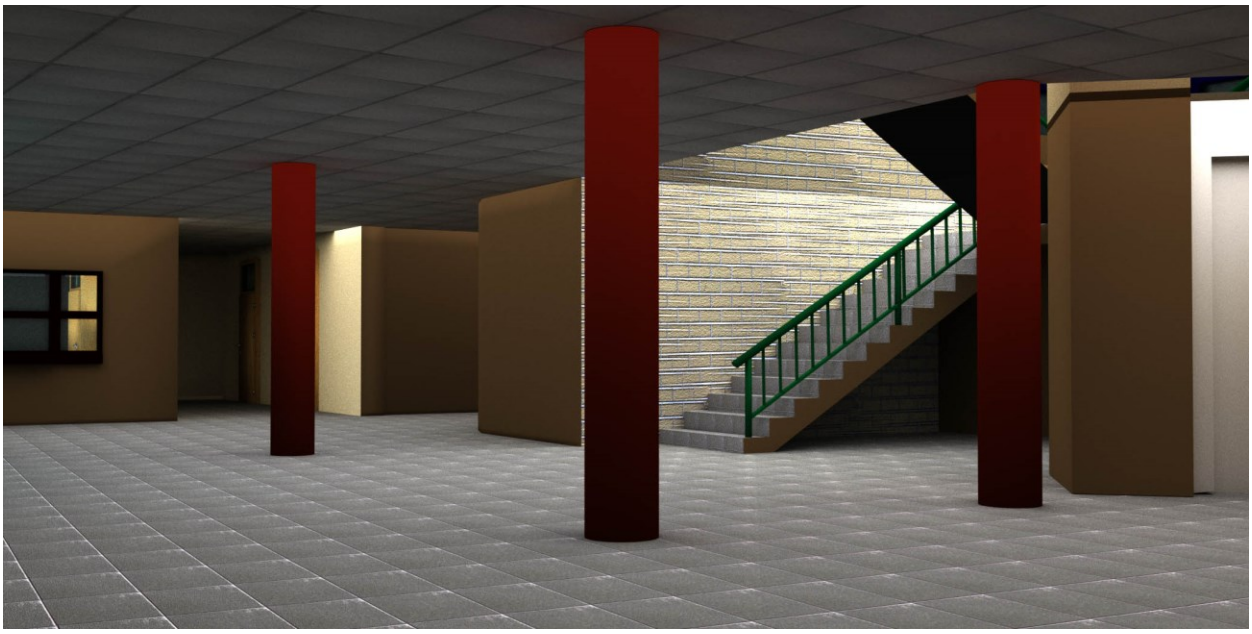

Figure 5. Example frame of rendered Omnidirectional view of the proposed “Poznan Hall 360” scene.

3. Summary

We have provided a 3D model (Blender) of entrance hall of building of Poznan University of Technology, which can be used to render synthetic omnidirectional content. The ability to directly render reference viewpoint in any place in the 3D space allows evaluation of depth estimation + view synthesis pipeline
We have also provided computer graphic images rendered with source blender file.

4. Copyrights

5. Acknowledgement

This work has been supported by the public funds as a DS research project for years 2017/2018.

6. References

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[2] Y. Ye, E. Alshina, J. Boyce, Algorithm descriptions of projection format conversion and video quality metrics in 360Lib, Joint Video Exploration Team (JVET) of ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29/WG 11 6th Meeting: doc. JVET F-1003, Hobart, AU, 31 March – 7 April 2017.

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[4] T. Senoh, K. Yamamoto, R. Oi, T. Mishina, M. Okui: Consideration of depth format. ISO/IEC JTC1/SC29/WG11 MPEG m15047, Antalya, Turkey, Jan. 2007.

[5] D. Rusanovskyy, F.-. Chen, L. Zhang, T. Suzuki, "3D-AVC Test Model 8", Joint Collaborative Team on 3D Video Coding Extensions of ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29/WG 11, 6th Meeting: Geneva, CH, 25 Oct. – 1 Nov. 2013, Document: JCT3V-F1003.