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Rendering and Analysis of Omnidirectional Videos using a Facebook 360 Camera

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Many viewers are becoming curious about the surroundings of a camera when it has taken a video in a location interesting to the viewer. Because of this curiosity, video technology has been made to create 360-degree videos, in which a viewer can watch a video and interact with it to view the area surrounding the camera itself. Using a Facebook 360 Camera, high-level research is being done to learn which set of parameters given during the rendering process provides a better Quality of Experience (QoE) to the viewer. With better QoE, images in the video can be displayed more clearly and more accurately. During the research, different combinations of render settings are documented to keep track of which render settings have been used, and to keep documentation of which render settings have provided better video quality. Along with learning which combination of render settings provide better QoE, research will include the use of image quality metrics for comparisons of 360-degree video quality. These metrics are Peak Signal to Noise Ratio (PSNR) and Spherical PSNR (S-PSNR).

The Facebook 360 camera system consists of

17 Point Grey Grasshopper3 camera heads. Sunex wide-angle lenses are provided for 14 horizon-facing camera heads. Fujinon fisheye lenses are provided on the camera facing upwards towards the sky, and for the two cameras facing downwards towards the ground. Each camera has the capability to capture videos with resolutions of up to 2048x2048, at up to 90 frames per second. A machine called a “Camputer” Rugged Computer is connected to the camera heads through a series of cables running to and from the camera heads, and a PCI-Express Expansion Box. To store the videos captured on the camera system, the “Camputer” is connected to an 8-Bay 12G SAS RAID Tower, capable of storing up to 8 TB of data with a count of eight 1 TB solid state drives. Along with the hardware, free software is available from Facebook that performs the stitching and rendering of the video captures from each camera. Though the cameras are limited to a 2048x2048 resolution, the stitching and rendering software is capable of exporting videos with resolutions of 4K, 6K, and 8K.

For this demo, users will be able to view

two different types of videos taken by the Facebook 360 Camera. The first video will be a video rendered and injected with metadata. Injecting these 360-degree videos with metadata allows for the video to be viewed as if the viewer is standing in the middle of what the camera has captured. These videos can be seen on a mobile device, or on a computer, and the viewer has the capability to change the viewpoint of the video.



Fig. 1. Facebook Surround 360 Camera system setup in University Gallery for “North by Nuuk - Greenland After Rockwell Kent” exhibit

The second video will be a panoramic video of what the camera has captured. Though not an interactive video, viewers can see the product of the rendering process before metadata is injected in to the video. A large selection of the videos for the demo will show a part of the reception event for the “North

by Nuuk - Greenland After Rockwell Kent” photographed by Denis Defibaugh exhibit in University Gallery at Rochester Institute of Technology. The camera system set up is shown in Fig. 1.

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LINKS

YouTube playlist of videos not injected with metadata: https://www.youtube.com/playlist?list=PL_i_an53hyJb2oWNAi9Jki9HjXqoKy4Hn

YouTube playlist of videos injected with metadata: https://www.youtube.com/playlist?list=PL_i_an53hyJY4zhCSOddTYLzu9BCIebGA