Technical Disclosure Commons

Defensive Publications Series

November 08, 2017

Conversion of a 3D scene into video

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ABSTRACT

Three-dimensional graphics capabilities of portable devices such as smartphones are limited by their hardware. Even smartphones that include graphics processing units (GPU) cannot produce the graphics processing performance of a device (e.g., PC) that uses a more powerful desktop-class graphics processor. This disclosure describes techniques to create 360° video from a specified three-dimensional scene on a virtual desktop computer using a web browser and advanced graphics hardware. The video generated using this technique can be stored on a video hosting website and is suitable to be rendered by devices that lack advanced graphics capabilities.

KEYWORDS

- 360-degree video
- 3D graphics
- Virtual reality
- WebGL
- Cloud rendering

BACKGROUND

Emerging video formats, such as virtual reality (VR), 360° video, such as immersive, spherical, VR, simulated, and panoramic video, and others are becoming increasingly popular. These video formats enable viewers to interact with the videos, e.g., using a gesture such that viewers can see other points-of-view, and to view immersive panoramic video in virtual reality. These video formats are more resource-intensive than traditional single-view video formats.

Portable devices with limited graphic processing capabilities, e.g., smartphones, cannot render such content with the same quality as a desktop computer.

DESCRIPTION

This disclosure describes techniques to convert three-dimensional content, e.g., a 3D WebGL scene into video, e.g., a 360° video.

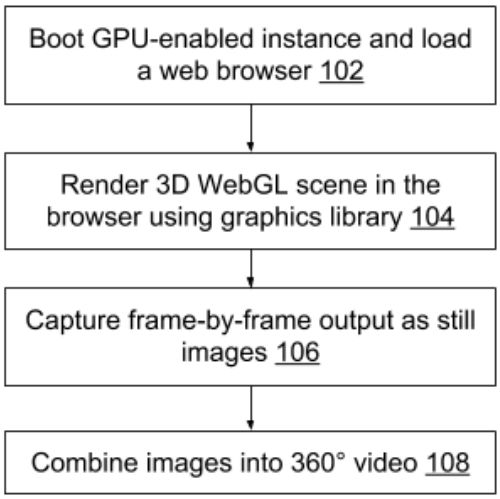

Fig. 1: Converting a WebGL scene into 360° video

Figure 1 illustrates an example method to convert a 3D WebGL scene into 360° video. First, a GPU-enabled instance, e.g., a virtual machine hosted on a cloud computing service, is booted up remotely (102) and a web browser is launched within the instance. For example, the virtual machine can run a desktop operating system such as Linux. Further, depending on the cloud computing service, the GPU-enabled instance can have an associated desktop class GPU. Such instances typically have no screen attached. Therefore, the browser is run a special environment that enables the browser to detect that a screen is attached, e.g., a virtual screen using an emulator.

A URL for the 3D scene rendered by a graphics library (e.g., WebGL) is loaded using the web browser (104). For example, the web browser can be controlled using a program (e.g., a Python script). Once the web page is loaded correctly, images are grabbed from the virtual screen. Using custom programs, navigation of the 3D scene is automatically performed, e.g., jumping to points of a timeline. The current frame of the scene is extracted, e.g., using the program. The extracted frames are captured as still images (106) and saved to disk.

The captured frames are combined (108) to output as a video. Sound corresponding to the frames can also be captured.

To generate 360° video, the three-dimensional scene is projected onto a two-dimensional projection, e.g., a 2D equirectangular projection such that the three-dimensional scene can be captured as an image to be used as a frame in 360° video. The video generated using this technique can be stored on a video hosting website and is suitable to be rendered by devices that lack advanced graphics capabilities.

The described techniques can be used for rendering virtual reality scenes as video. Further, if the virtual reality scene is a rich media advertisement, the techniques can be used for verification, e.g., by providing customers a video to show how the advertisement played out over time. Such verification helps drive customer satisfaction and confidence in advertisement delivery for the advertising platform, and is an improvement over a system that can only deliver screenshots.

CONCLUSION

This disclosure describes techniques to create 360° video from a specified three-dimensional scene on a virtual desktop computer using a web browser with advanced graphics

capabilities. The video generated using this technique can be stored on a video hosting website and is suitable to be rendered by devices that lack advanced graphics capabilities.