Web-based Immersive Panoramic Display Systems

for Mining Applications and Beyond

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Abstract—**The mining industry is interested in novel visualization systems to improve operational efficiency. Technologies to enhance the operator's experience are advancing but there is a lack of evidence supporting the extent to which these emerging technologies positively affect user experience and performance. In this paper, we describe initiative of web based immersive panoramic display system that could be used in mining context. This idea represents a step towards new platforms that will increase the efficiency and safety of the mining operations by video monitoring with annotations of information coming from analytics engines.**

Keywords-Panorama; VR; AR; WebGL; 3-D Annotations.

I. PAST WORK

In the past, we have developed a Panoramic Display System that was effectively used in scientific and industrial environments to visualize 360-degree panoramas in real-time (15FPS) [1]-[3]. The video was constructed out of six streams of images captured by PointGrey LadyBug3 camera [4]. The camera was located in a remote operating location, and stitched video buffers were sent to a location where 3-m hemispherical dome was installed. The stitched images were displayed on the virtual sphere and transformed to a fisheye projection in order to have proper mapping proportions and viewing perspectives, see Figures 1 and 2.
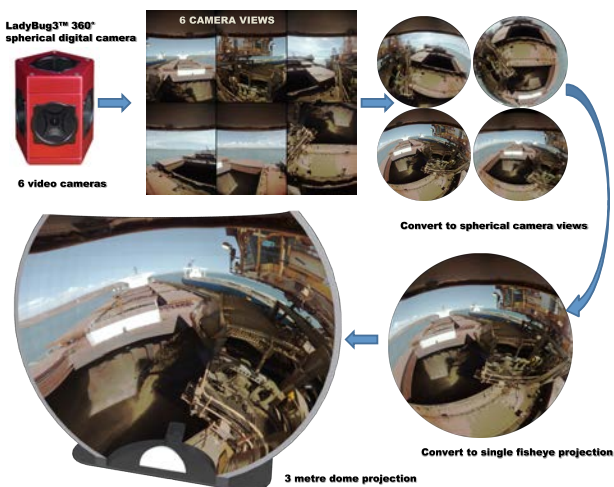

Figure 1. Panoramic Display System – Image Processing Workflow.

Figure 2. Virtual Mining Centre, CSIRO in Pullenvale.

II. WEB BASED PANORAMIC SYSTEMS

The new prototype is currently under development for displaying immersive video environments using technologies supported or natively built into modern web browsers (WebGL [5], WebCL [6], WebRTC [7]). Based on our previous experience, we intend to develop and use the capabilities of 360-degree immersive video in web-based environments, but with playback inside of a Head Mounted Display (HMD), such as, an Oculus Rift [8] (see Figure 3), 3-m hemispherical dome, or in the browser window itself.

Figure 3. Left: panoramic camera. Right: Oculus Rift VR.

The equipment to be used to produce 360-degree videos, is six or twelve GoPro 3+ cameras mounted on 3D printed mounts, 360-HEROS [9]. The videos are to be played back,

inside the web browser (Figure 4), in full-screen mode. WebGL based code is used for rending. Additional functionality will be provided to enable video streaming using standard web technology, WebRTC, for multi-users chat and data communication in web browsers. The intention is to have multiple users existing and observing the same virtual environments. Discussions and measurements of objects in the environment could also occur through placement of 3-D annotations.

III. CONCLUSIONS

The present paper described new prototype for displaying robust immersive video environments using modern web technologies natively built into web browsers. Such system would have many potential applications; some of them are listed below:

- 3D movies for training purposes,
- Immersive Tele-conference systems,
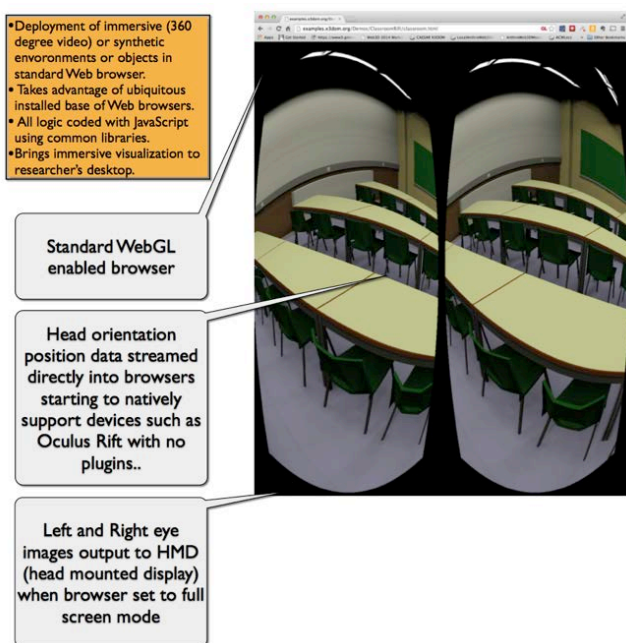- Manufacturing,
- Remote supervision,
- Forensics.

Figure 4. Video playback occuring in web browsers.

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