The Fresnel Video Lens

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Abstract

The Fresnel Video Lens (FVLens) is a two dimensional array of video monitor/camera pairs that is intended to visually connect adjacent spaces through an optoelectronic medium that serves as both window and lens. It is an exercise in *active optics*, the term coined by Paul Virilio to refer to capabilities enabled by the optoelectronic decoupling of source (direct light) and signal (indirect light). [1] The FVLens borrows from the principle of the optical Fresnel lens which reduces the mass of a traditional glass lens by dividing it into multiple concentric thin sections with surfaces that match the refractive properties of the original surface geometry but with reduced thickness. Likewise the FVLens flattens the geometry of curved displays that require a depth equal to the *sagitta* (height) of the arc of the display (figs. 1, 2). This allows for it to be installed within a wall of standard thickness serving as a window between adjacent spaces. Although it could be used as a telepresence display by transmitting video streams from remote locations, the primary exercise is one of constraint, examining methods for reintegrating bifurcated spatial experience. Rather than traditional panoramic views the perspective distortions of the Fresnel Video Lens follow the lead of the fragmented imagery found in some of the photo collages of David Hockney such as *Sun on the Pool Los Angeles 1982* (fig. 3), *Kasmin Los Angeles 28th March 1982*, and *Brooklyn Bridge, 1982*. Instead of stitching multiple sources into a single seamless image these constructions more closely match the real-time assembly of visual fragments into the cohesive perception of space that takes place when we see.

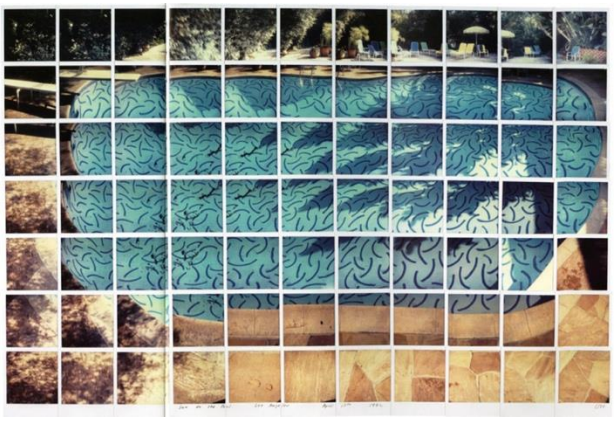

Fig.3. *Sun on the Pool, Los Angeles, 1982,* David Hockney, composite polaroids,

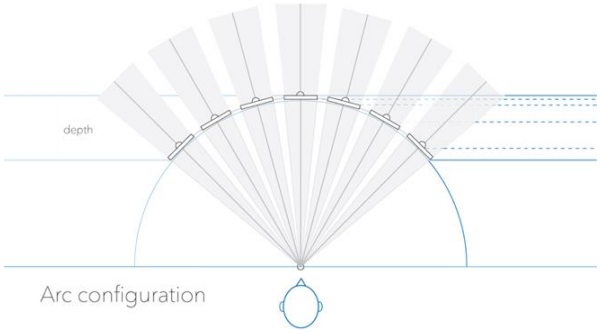

Fig 1. *Arc Configuration Diagram*, 2018, Steve Boyer

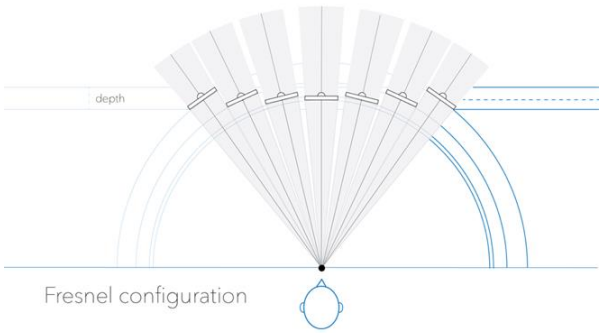

Fig 2. *Fresnel Configuration Diagram*, 2018, Steve Boyer

Background

Digital media tend to void space by drawing the viewer into the space of the media. My work aims to amplify space by drawing the media into the space of the viewer.

Video screens of every scale are dominating the built environment from smartphone screens, television screens in restaurants, gas stations and train stations, to the skyline scaled LED images that are bringing the dystopian vision of *Blade Runner* to cities around the world.

The vast majority of the content that appears on these screens is spatially decoupled from its environment. This amounts to the injection of *invasive content* which has the impact of drawing our attention away from the environment and into the content of the screen. This results in the formation of disintegrated spaces and bifurcated experiences in which we are torn between both worlds. Little effort is made to integrate these experiences by limiting content to audio and imagery that are spatially coherent. *Invasive content* is space negating. The FVLens is offered as a platform to examine optoelectronics that are space affirming by reintegrating content with environment.

Perspective Distortions

The FVLens serves as a window providing a link between adjacent spaces. Unlike with standard flat screen views the perspective distortion of the FVLens is a more natural one allowing viewers to see multiple perspectives simultaneously rather than the single planar projection of an image onto a flat surface.

The current embodiment of the FVLens proposes a 5x7 array of 35 Rasperry Pi cameras and monitors with Processing and OpenCV installed to provide the ability to process the video streams (fig. 4). While the live feed from the cameras is passed through to the monitors mostly unaltered the platform allows for minor manipulation of the video signal, especially subtle distortions of time including frame skipping, expanding and compressing time, as well as some spatial modifications such as changing apparent focal length. Artificially imposed constraints of allowed and disallowed operations are designed to maintain the integrity of the FVLens as an optical device rather than a medium for invasive content. As these subtle manipulations are introduced to the live camera streams the boundaries of native versus invasive content can be explored and defined.

The next iteration will add 2 servo motors to each camera/monitor pair. This functionality allows for moving the focal point of the FVLens, converting from a convex to a concave lens and other potential enhancements. The FVLens will be a platform for examining the complex relationships between our digital and physical presence.

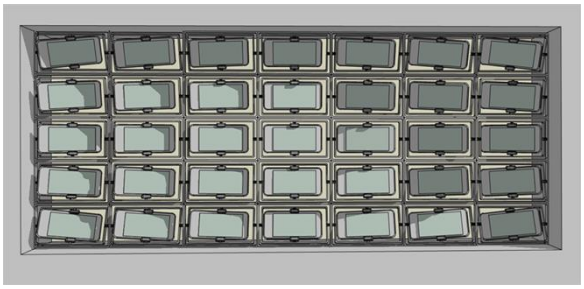

Fig 4. *5x7 Fresnel Video Lens*, 2018, Steve Boyer

References

1. Paul Virilio, *Open Sky* (London and New York: Verso, 1997), 35-36.

Biography

Steve Boyer is an artist, designer, inventor and educator with over 30 years of experience developing technology and creating content for a wide variety of interactive media including video games, electronic toys, musical instruments and installations. He has been on the faculty of leading art and design programs in the US including The School of the Art Institute of Chicago, Otis College of Art and Design, The University of California, San Diego and is currently Assistant Professor of Design at California State University, Long Beach. Mr. Boyer earned his Master of Architecture degree at The Southern California Institute of Architecture (SCI-Arc) where his thesis research addressed the growing tensions between digital media and architectural space. He also served as the Director of Research and Development for Interactive Entertainment at Vivendi Games and is the inventor of the volumetric LED display.