

BENDING LIGHT: STRANGE TALES FROM THE PROJECTIVE PLANE

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This paper presents an overview of the ongoing research and art practice from the Quadratura Video Projection Research Laboratory, which is concerned with exploring the medium of light; mainly through the utilisation of video projection and mapping techniques and disparate technologies coupled with more traditional optics such as mirrors, lasers, and illusions.



Shadows of Light #2, 2011, Quadratura, video projection, Copyright Quadratura Ltd.

This paper presents an overview of the ongoing research and art practice from the Quadratura Video Projection Research Laboratory, which is concerned with exploring the medium of light; mainly through the utilisation of video projection and mapping techniques and disparate technologies coupled with more traditional optics such as mirrors, lasers, and illusions. Quadratura also develop interactive works that explore the role of the observer in art; subverting the traditional one-way communication and creating emotive interactions that can either encourage and/or discourage participation within the viewing 'agreement'.

Each project from Quadratura has necessitated some degree of in-house software development as ideas and concepts within the work have evolved. The main focus, PatchBox, is a highly complex and specialised application; an amalgamation of six years exploration into video mapping techniques. It is capable of a wide range of functionality, from performing simple affine transformations of video onto arbi-

trary flat surfaces, to dynamically mapping any combination of real and virtual geometry onto any physical structure from multiple video projectors, from multiple physical viewpoints to facilitate real-time, high resolution, digital trompe l'oeil effects.

PatchBox is designed in such a way as to be flexible enough to be used as a VJ performance tool, a rapid urban video projection bombing system, or for long running multi-screen interactive installations. However, it was never designed to be a commercial product, or indeed used by anyone outside of Quadratura. This decision has facilitated a rapid development schedule as it is not ever had to be used by a third party; rather it only has to keep pace with our artistic requirements.

Video Mapping

PatchBox was first utilised in 2007 for a large scale audio/visual installation in the historic Holland Park located in London; a major commission by Kensington and Chelsea Council. Alex May (real-time video artist and programmer) and Martin A. Smith (sound artist and composer) – who would later become the directors of Quadratura – developed a series of original video projection and lighting installations that formed a darkly cinematic narrative through the ancient wooded section of the park taking visitors on a sublime journey through life, death, and remembrance. PatchBox was used to map a multitude of different blinking eyes (looping video clips) across the canopy of a 30 foot tall oak tree from a single laptop powering one video projector. The real-time functionality allowed dynamic placement and adjustment of each video element.

More recently, Quadratura created a large scale, site-specific architectural video projection mapping for the 2011 Kinetica Art Fair in London. The installation, entitled “BioReactor”, was conceived and developed in collaboration with bio-artist Anna Dumitriu who described it as:

“A dirty wetware body, thick with bacteria and mutated by electromagnetic fields, which learns to feed off the digital technology that surrounds it, leeching energy from every data source and transforming - not only itself but also the world around it.” [1]

PatchBox was utilised to accurately map video onto the complicated architecture of P3 in London where the event was taking place. Due to the dynamic nature of the mapping system, it took just 10 minutes from turning the computer on to a final, pixel accurate alignment.

Interactive Installations

Since 2008 Quadratura have been developing interactive video installations exploring the relationship between art and the observer.

In 2009 Quadratura exhibited a series of interactive video installations in London entitled “Shadows and Falling Light.” Each installation was carefully designed to present a different form of interaction to the visitor without needing to be explained in any way. This was achieved by devising one or two simple abstract ‘rules’ per installation that would be quickly understood.

“Shadows of Light” rewarded visitors that stood still, rather than moved about. As the visitor stands still, their silhouette is slowly drawn onto the wall in a randomly picked solid colour. If they stand still

even longer they find that the silhouette will begin to act as though it is spray painted, causing drips of 'paint' to start streaming down the wall.

Conversely, "Mesh" is a constantly moving mesh of electric blue lines. Touch any of the lines and it will break them like a beam of light. The mesh will attempt to reform around any physical obstruction (the visitor). Visitors tended to slowly stop moving so they wouldn't break any more beams.

Before 2011, Quadratura had developed their own technical solutions for tracking visitors as they interacted with the work based on infrared illumination and various background subtraction algorithms. In November 2010 Microsoft released the Kinect: a peripheral designed for the Xbox 360 that featured a video camera and depth camera. By utilising the depth camera it became almost trivial to segment and track visitors. While 'Kinect Hacking' has become a world-wide phenomenon, and there have been a great many examples of artists creating and developing concepts on the hardware, Quadratura believes that it was the first to publicly exhibit a Kinect based artwork in a gallery: "Shadows of Light #2" (2011) at Kinetica, London, February 2011.

"My Robot Companion" (2011) was a series of robot heads designed to promote discussion of the ethical issues of how we might relate to robots in society, created as part of Alex May & Anna Dumitriu's collaboration as artists in residence at Hertfordshire University working with the Adaptive Systems Research Group (ASRG). Exhibited at the Science Gallery in Dublin (June-September 2011) as part of their HUMAN+ show, the installation centred around 'Charley', a humanoid research robot created by Dr. Michael Walters from the ASRG, with a stripped down Kinect embedded on its chest, and featuring a video projected head. As visitors approached the robot, it would turn its head towards them, and its face would slowly morph into theirs. If more than one visitor stood in front of Charley, its face would become an amalgamation of all of their faces. It was designed to explore how people felt about a robot that looked (progressively) like them and/or their family, and at which point the "Uncanny Valley" effect might kick in. [2] "My Robot Companion" was awarded joint first prize for public understanding of artificial intelligence by the Society for Artificial Intelligence and Simulation of Behaviour.

Conclusion

Video projection is a powerful medium; it is able to non-destructively alter the appearance of surfaces on a large enough physical scale to present the observer with an environment that can be almost entirely digitally manipulated in real-time in response to their motion, pose, and proximity. Some instances of Quadratura's interactive artwork require observation to exist in any meaningful way; although the communication between the observer and the work is allowed to evolve within the artistic constraints designed into the system, whether it is physical, verbal or otherwise. Our challenge, therefore, is one of creating meaningful communication within the boundary of the technology.

References and Notes:

1. A. Dumitriu, "BioReactor," *Normal Flora*, <http://www.normalflora.co.uk> (accessed September 10, 2011)
2. M. Mori, "The Uncanny Valley," in *Energy* 7, no. 4 (1970): 33-35.