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## THE MONUMENT PROJECT (*SI MONUMENTUM REQUIUS CIRCUMSPICE*)

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### Abstract

This paper describes the concepts, ideas, background and operations of *The Monument Project (Si Monumentum Requiis Circumspice)* a digital video installation that produces a continuous stream of weather-responsive panoramic images from the top of the Monument in the City of London. The work, which was commissioned by Julian Harrap Architects, was part of a £4.5 million refurbishment of the 17<sup>th</sup> century landmark, designed by Sir Christopher Wren and Dr. Robert Hooke to commemorate the Great Fire of London in 1666.

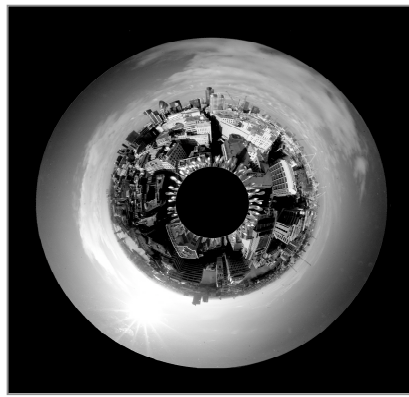
Keywords: Site-Specific video installation, panoramic images, weather systems, History of science, Computer art, Internet, Public art.

### Background

In 2007 I was approached by the London-based architects Julian Harrap, to develop a new video installation for The Monument in the City of London as a result of my previous work in Grizedale Forest, in the English Lake District. This earlier installation, *Interwoven Motion* (2004), involved mounting a circle of solar and wind-powered web cams at the top of a tall tree overlooking Lake Coniston, at a site with a view favoured by the Victorian critic and writer, John Ruskin. This work was the development of a number of previous gallery-based installations that explored and developed relationships and associations between the site or location of the work and the history of imaging technologies.

For example, *For William Henry Fox Talbot (the Pencil of Nature)*, (2002) relayed a stream of solar-powered live digital images of the famous oriel window at Lacock Abbey in Wiltshire- the subject of the world's earliest surviving photographic image to the Victoria and Albert Museum in London. The continuously refreshed images of the famous window at the abbey were projected full size in the London Museum, providing a digital link between the two sites bridging the geographical and temporal space between the original image and the site of its creation.

Fig. 1. A circular panoramic image from the installation.(© Chris Meigh-Andrews)



### The History of The Monument

The Monument to the Great Fire of London, designed by Wren and Hooke and completed in 1776 is the largest free-standing stone column in the world. It stands 211 ft high and is sited in the heart of the financial hub of London near to the river Thames. Credited to Wren who as chief architect to King Charles II oversaw the project, it is now understood to be mostly the work of his friend and associate, the scientist and polymath Robert Hooke, who was at this time the city surveyor. Both Hooke and Wren were accomplished scientists as well as architects, and the design and construction of the Monument reflects the complex nature of their interests.

It is now clear that the Monument had a dual function, and in addition to its role as a commemoration of the great fire and the resurrection of the city in its aftermath, the Monument was also a huge scientific instrument.<sup>1</sup> Both men were active members of the Royal Society and both had experimented extensively with optics. Wren had made his reputation as an astronomer before becoming an architect, and the Hooke, had published one of the earliest books on microscopy and had previously built a zenith telescope at his lodgings.<sup>2</sup> The two men ensured that the design of the Monument, whilst fulfilling its main purpose as a landmark and memorial, would also enable them to continue their experiments. The base of the Monument contained a small room for an astronomer to gaze at the night sky. The hollow shaft of the Monument, ascended by a spiral staircase of precisely equal spacing, was ideal for conducting experiments with pendulums, and for measuring the effects of gravity and barometric pressure.

### The Project

Fascinated by the dual function of the structure, I decided to develop a work that referenced its scientific and historical significance and its role as a Monument sited in the centre of London. The architect's brief required that the installation provide access to the magnificent views available from the top to those who were unable (or unwilling) to climb the 311 stairs to the observation platform, and I wanted to explore the potential for a work that would respond to the surrounding and ever-changing weather conditions and provide high-definition panoramic images of the view for display on a video screen located at the base of the Monument and to make an image-stream available on the internet. The brief also stipulated that the installation should be capable of providing updated images twenty fours a day, seven days a week and be operational for three years! It was clear to me that this challenging project would require a knowledgeable and skilled collaborator. Working closely with media technologist Onno Baudouin at Sandbox, a digital media R&D lab at the University of Central Lancashire, we considered a number of options before selecting a robust and reliable digital stills camera to provide the images for the project. Onno developed eight different custom software programs for the installation including camera control and the manipulation of the image output of the camera all remotely accessible via the internet. The image stream from the camera is modified in real time by meteorological information about the wind speed and direction, air temperature and pressure.



Fig. 2. The Monument of the Great Fire (Photo © Chris Meigh-Andrews)

**Fig. 3. The weatherproof camera housing and weather station installed at the top of the Monument ( Photo © Chris Meigh-Andrews)**



### Details of the Installation

The installation provides a live stream of continually modified time-lapse images 24 hours a day, 7 days per week that can be accessed on a dedicated web site at [www.themonumentview.net](http://www.themonumentview.net) and as a “live” image via a video screen display which will be sited on the piazza near the base of the Monument. The web site also makes available a continuously updated series of “unwrapped” still images of the panorama from the top of the Monument which are digitally unfolded from the circular images produced by the camera/lens system.

A computer-controlled digital stills camera equipped with a Kidan VR 360 lens enclosed in a custom-produced weatherproof housing provides 360-degree panoramic views from the top of the Monument. Changes to the image display are facilitated by a dedicated computer system with interfaces and software to modify the image in response to changes in the ambient weather conditions of the surrounding environment, specifically wind velocity and direction, average temperature and barometric pressure. This data is used to modify the live output of image stream in a number of different ways relating to the changes in the weather, so for example the frame rate of the image stream relates to the wind speed, and the rotation of the image relates to the wind direction. Ambient temperature modifies the hue of the image, whilst changes in the pressure modify the image contrast.

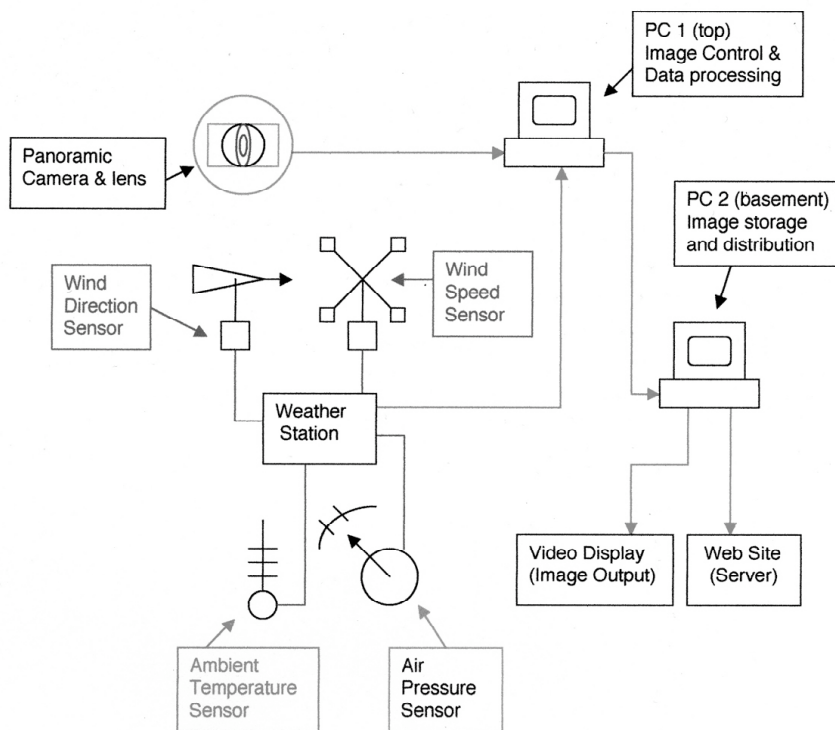
### Technical Operations

Both the circular and “unwrapped” output image modes use a hi-spec PC. The images are stored in 16GB of memory (FBDIMM) in a compressed format at 2048x2048px. Depending on the wind-speed these are bitted at over 60FPS to a VGA or DVI output. Each time a new

image is sent from the camera (via ethernet) the previous image is dropped. This results in a continuous, but ever changing 24 hour time-lapse sequence. Each time a weather condition changes this affects the video images in real-time using GPU shaders that affect contrast, brightness, image rotation and colour-levels. The software was written by Onno Baudouin using C++, Python, C# and PHP and OpenGL in a native 64bit Windows application. All programs communicate via a custom build TCP/IP protocol. The operating system runs from an SSD for reliability. All images produced by the camera system are backed up to a large computer storage housed in the basement of the Monument. In total there are 8 different computer programs running simultaneously. If, for any reason one element fails to work, the system has been designed to continue to display the last available image. The system was also designed to kill any applications that stop working and autorestart them.

### References and Notes

1. Leo Hollis, *The Phoenix: St Paul's Cathedral and the Men Who Made Modern London*, (London, UK, Weidenfield and Nicolson, 2008.)
2. Lisa Jardine, *the Curious Life of Robert Hooke: the Man Who Measured London*, (Lonon, UK, Harper Collins, 2003.)



**Fig. 4. Schematic diagram of the installation (© Chris Meigh-Andrews)**