

## Surveying in the Fine Arts

By Bruce Harvey

**Survey team:** Dr Bruce Harvey, Surveying & Spatial Information Systems, UNSW. John Damina, CR Kennedy & Co, Sydney. Andreas Starick, A student at Department of Surveying and Cartography, Dresden University of Applied Science, Germany. Currently studying laser scanning at UNSW under the supervision of Bruce Harvey. Dr Paula Dawson, School of Art, College of Fine Arts, UNSW

### Art Research Project:

The survey is part of a project to study the use of darkness (shadows) in visual representation in traditional and holographic images. The project will analyse the role of darkness in three pictorial case studies, drawn from the visual arts, through the application of three-dimensional holography. Parts of three paintings are shown below, they are by Giotto in the 1300s, Masaccio in the 1420s, and Leonardo da Vinci in the 1490s.



### Survey:

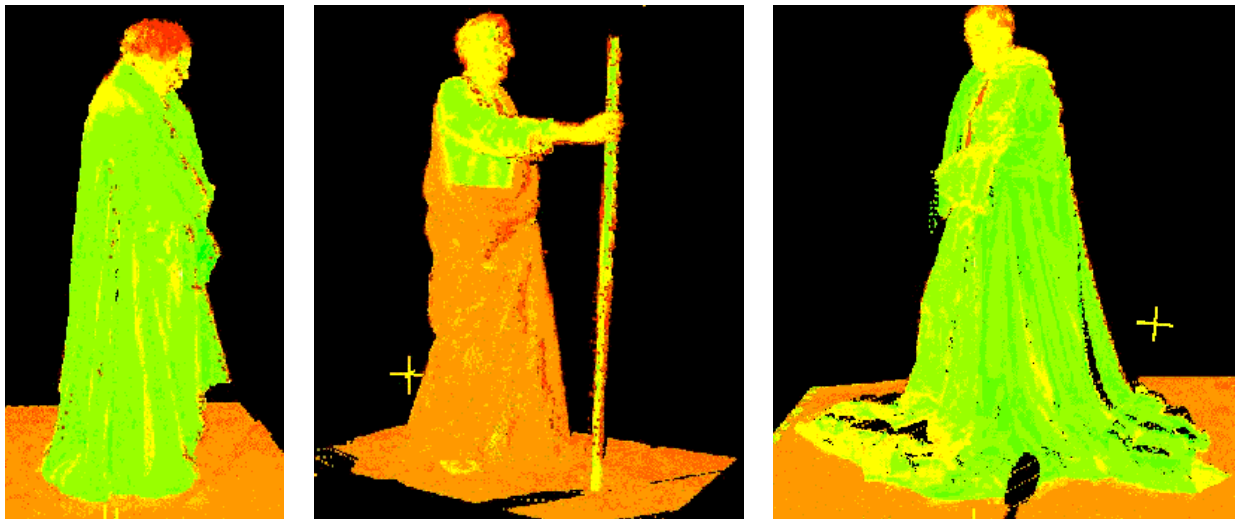
The model, eminent art historian Dr John Gage, was attired in drapery with folds and positioned similarly to the historic paintings. He was then quickly scanned with a Cyrax 2500 3D laser scanner, from two positions each about 4m away. Each scanner location measured about 1 million points in the scene and captured 3D coordinates of each reflected point. Using two scanner locations enabled back, front and one side of the model to be seen and measured. This allows the final holograph to be rotated through about 180 degrees. Four special control mark targets were placed in the scene and measured from both scanner locations. This allows the two data sets to be combined (registered) in a process similar to transformations in photogrammetry. We asked John, our model, to stand in the pose virtually motionless while we scanned him from one position and then moved the instrument to the second position and scan again from there.

A similar procedure was conducted for each of the three separate attires, each matching one of the paintings.

**Results:**

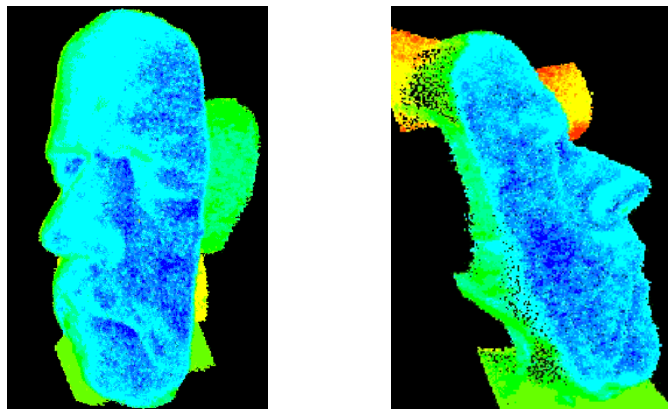
For each of the three scenes, images were visible in real time as scanning was taking place. The software controls the measurement process as well as modelling and analysis of the 3D images. Later processing combined data from the two scanner locations for each scene. It is interesting to note that John, our model, was able to stand in the pose virtually motionless while we scanned him from one position and then moved the instrument to the second position and scan again from there. Results indicate that our model was able to stand in the pose sufficiently motionless to meet the accuracies needed for this project.

Each model image contains hundreds of thousands of precisely measured 3D coordinates. The Giotto image contains over a million points. (G 1,071,962 M 478,476 L 320,906)



The images above are screen captures of the 3D models from a single viewpoint. Far more detail can be seen when the appropriate software is used to zoom into and rotate the model. The false colours shown above represent the intensity of the reflected laser. The intensity value has more uses in other applications than in this survey.

Fine scan of plaster cast of face:



Examples of other applications of the laser scanner can be seen at:  
[www.gmat.unsw.edu.au/News/Cyrax/cyrax\\_news.html](http://www.gmat.unsw.edu.au/News/Cyrax/cyrax_news.html)