

Every Nook and Cranny

The Mephisto Extreme 3D-Scanner from 3DDynamics relies on AVT Pike digital cameras to scan objects, humans, animals or plants with the highest possible precision in three dimensions.

3DDynamics

3DDynamics specializes in three-dimensional scanning. This high-tech company, located in s'Gravenwezel near Antwerp (Belgium), develops hardware and software solutions for digitizing any object. Applications are manifold, ranging from the digitization of museum pieces to the aviation industry and even to medical imaging.

The Challenge: Digitizing Three-Dimensional Objects

In our digital age, everything is stored, processed and communicated on computers: messages, pictures, music, movies, technical data, plans, and so forth, on top of which, most content is digitally produced. If there is no digital original of a document, it is simply scanned in. But how should a museum digitally archive an ancient Egyptian bust? Or how should a scientist analyze objects in nature, such as bones or plants, with computer programs? How can an engineer measure or re-produce a competitor's product without the original CAD data? The solution lies in 3-D scanning, the digitization of three-dimensional originals as virtual models.

The Solution: Mephisto Extreme 3D-Scanner

Mephisto is the name of 3DDynamics' 3-D scanners. Its combination of premium hardware components and proprietary soft-ware delivers high-resolution, true-in-every-detail 3-D models of ancient works of art, industrial components, materials, or biological substances. "Some structures – fur or black materials, for example – are a challenge for a 3-D scanning system", explained Aivaras Grauzinis, the company's CTO. "With Mephisto, even these difficult objects can be digitized."

Mephisto Extreme consists of a high-quality projector and two digital cameras that are controlled by the system computer and synchronized with each other. The projector is an Infocus DLP projector with up to 3000 ANSI lumens and a 2000:1 contrast ratio. Using the projector, a raster is projected onto the original object. Depending upon the object and the desired resolution, the Mephisto software generates various raster structures from binary black-and-white to complex greyscales and color gradients. A digital camera from Allied Vision Technologies captures images of the spotlighted object and transfers them via a FireWire connection to the PC for further processing. From the projection of the raster onto the object, the Mephisto Software derives its volumes with the highest possible precision and generates the virtual model. A second camera records the object's surface. A high-resolution DSLR camera from Canon's consumer line is used. With resolution up to 12 megapixels, this camera captures the surface

colors and patterns which are then transferred by the software onto the 3-D model.

The projector and both cameras are mounted together onto a shared bracket with a pedestal. The hardware is relatively easy to pack and transport for use in scanning on location, at archaeological dig sites, for example. An optional turntable is available for 360° shooting. The so-called Mephisto Turntable is controlled directly from the software interface and synchronized with the cameras. For larger or heavier objects that cannot fit on the turntable – for the digitization of a complete human body, for example – up to nine scanners can be networked to one computer. Thus, different locations and angles can be processed simultaneously.

High Precision and Convenience of Use: AVT Pike

The quality of the image data that the Mephisto software will analyze is critical for the scan's precision. A Pike F-210B HDTV camera from Allied Vision Technologies ensures that this quality level will be met. This premium-quality imaging camera is equipped with a highly sensitive Kodak sensor with HD resolution. Image data are transferred via the Pike's high-speed IEEE1394b interface to the system PC at a rate of up to 30 frames per second. The camera is also equipped with an aspherical 17-35mm zoom lens from Nikon. "We found a top-flight, dependable camera in the AVT Pike, one that is best equipped to meet our high demands," said Aivaras Grauzinis. "Above all, the high image quality, especially the high light sensitivity with low noise, is essential for the quality of the scan. At 30 images per second at HD resolution, the image rate is more than satisfactory. "

The "plug-and-play" functionality of the FireWire connection also played an important role in camera selection. "Mephisto Extreme is a portable system used by people who aren't necessarily experienced with professional imaging technology. The easy networking of the components with standard connections used in consumer electronics, like USB, FireWire and VGA, raises the comfort level for users," Grauzinis continued.

Use in Practice: Scientific and Biomedical Applications

Mephisto Extreme is the result of seven years' worth of research and development, and has already been in successful use in different applications for several years – digitizing biological samples in medical technology that are either dried, in wax or conserved in formaldehyde, is but one example. Mephisto Extreme has also been used in dentistry. Likewise, archaeologists value the Mephisto scanner's precision and flexibility. The Mephisto line includes other scanner models for every budget, using either the AVT Pike or AVT Guppy digital cameras