

3d printing

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3D CSI

June 24th, 2008 | by admin |

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We've all seen those amazing police sketch artists who transform vague witness accounts into highly realistic portraits, often featured in "WANTED" posters. More recently artists have used manual techniques to create lifelike head and face models by applying clay "muscles" and "skin" to casts of skulls.

Today we see the same function accomplished with 3D printing technology: Penn State's College of Information Sciences and Technology have created realistic busts of long-dead children. Using previously made 3D information obtained with a special haptic interface, IST senior project associate Wade Shumaker printed the busts on a Z Corp 450 in record time.

The "magic moment" occurred when Shumaker pulled the busts from the Z Corp's dusty build chamber, gazing upon the faces for the first time.

As is done with 2D photographs today, the new 3D technology will enable a variety of uses for face models including identification of unknowns, simulated aging, etc. Once again 3D technology opens up a new niche industry.



Wade Shumaker, IST senior project associate, reviews an image of Jane Doe on a monitor in the college's Digital Atelier



Recent experiments in IST's new Digital Atelier have demonstrated the facility's potential to help identify missing persons and, in doing so, produced tangible imagery related to mysteries dating back as far as the 19th century.

The methods used may point to a new way to protect children against abduction through the use of 3-D scanning and printing technologies, much as keeping identifiers such as photos, fingerprints, and DNA samples do today.

Working in collaboration with the National Center for Missing and Exploited Children (NCMEC), Wade Shumaker, IST senior project associate, has created the busts of two children: One depicts the believed appearance of a girl whose skeletal remains were found two years ago in the debris of a burned-out home in central New Jersey. The second is of a boy whose lead-lined coffin was accidentally disturbed in 2005 by workers in the Columbia Heights neighborhood of Washington, D.C.

Through two years of intensive detective work, the Smithsonian Institution has identified the boy as William T. White, who died in 1852 in his mid-teens. The graveyard in which he had been laid to rest was later moved, but his coffin was missed and not to be discovered for a century and a half. The girl died at between 5 and 9 years old, and has been dubbed Jane Doe because her identity is still unknown.

Using 3-D files from Joe Mullins, a forensic artist at NCMEC, Shumaker “printed” the busts of the children with a ZPrinter 450, a rapid prototyping device more typically used by manufacturers to create product models.

Mullins created his original files using a haptic device that provides an artificial tactile sense when used to sculpt an image. Where it once took him two weeks to produce a model with clay, the haptic technology—a SensAble Technologies Phantom Omni—made it possible to create a bust of Jane Doe in three days.

Using geometry files measuring hundreds of megabytes in size, the printer in IST’s Atelier built the likenesses of William and Jane layer upon layer with plastic powder and adhesive in a process which took several hours to complete. The results are roughly half life-size, but no less remarkable in their realism.

According to Shumaker, it was an eerie experience when he first freed the bust of Jane Doe from excess powder after a night-long production run.

NCMEC forensic specialists Joe Mullins (left) and Glenn Miller (right) each produced a different reconstruction of the appearance of William White. Mullins has collaborated with IST to create busts of White and Jane Doe.



“There was a sense of ‘who are you?’,” he said, wonderingly.

NCMEC has the capability of such feats as creating life-like digital likenesses of children from discovered remains, and “aging” photographs of youngsters who have been missing for some time. However, this new approach may open the way for effective identification of missing children.

“It gives a more concrete sense to the entire experience,” Shumaker said.

While further discussions are ahead for IST and NCMEC, the models Shumaker produced of William White have provoked interest from the History Channel, which has expressed interest in the boy and the fascinating work that went into determining his identity.

IST’s Digital Atelier, or workshop, is located in the Atrium of the IST Building at Penn State’s

University Park campus. Currently, it is home to the 3-D printing device as well as a 3-D scanner, also produced by Z Corporation, a haptic device like that in use at NCMEC, and supporting technologies. Plans call for the atelier to become a place to foster creative, cross-disciplinary work bringing together the arts and information sciences.



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