POLHEMUS
First in the third dimension®

Polhemus FastSCAN™ Simplifies 3D Modeling

Background

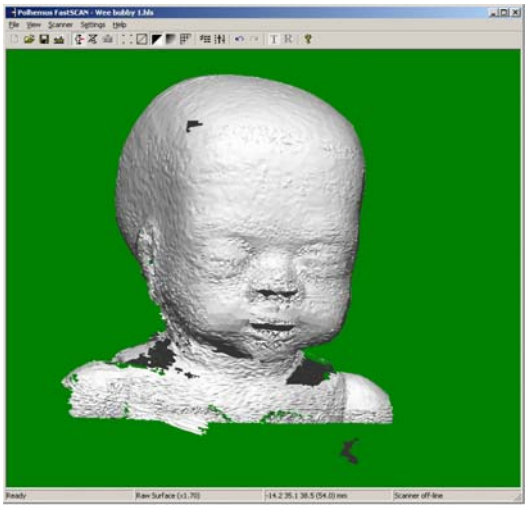
A special project was commissioned by the Research and Development Division of Tru-Test Ltd, a multinational company who designs and develops agricultural technology solutions. Tru-Test used 3D models of typical pre-mature baby's heads to aid in the design of a specific electrode system for pre-mature infants which could be used with a new type of EEG monitoring device. Specifically, Tru-Test was looking to use the model in order to determine the size and geometry of the electrode to fit the shape and curvature of the heads.

Doll A (left)

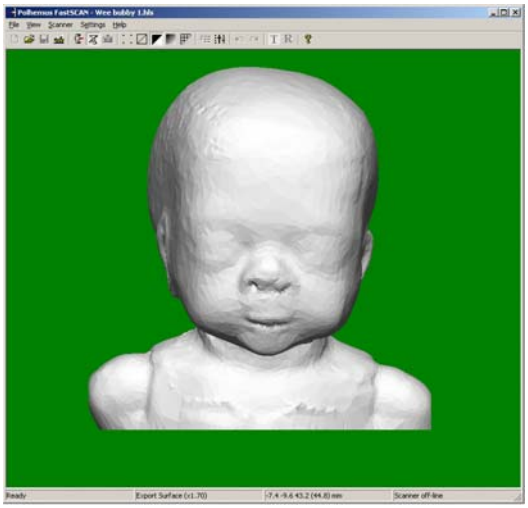
Doll B (right).

Using RBF software to fill-in scans

The construction of Doll A posed a potential problem for the scanner in that the doll was made of semi-opaque rubber, which when scanned, gave a less defined (or noisy) surface. Doll B was of a ridged construction, with a painted surface, that scanned very well. To counter the noisy scan of Doll A, Tru-Test used the Polhemus Radial Basis Function software (RBF), which smoothes out surfaces and fills in holes on scans to create water-tight models. During these processes, it was important for Tru-Test to maintain as accurate of a scan a possible. Running the original scan through FastSCAN RBF software created a model that was within sub-millimeter tolerance from the original surface points.



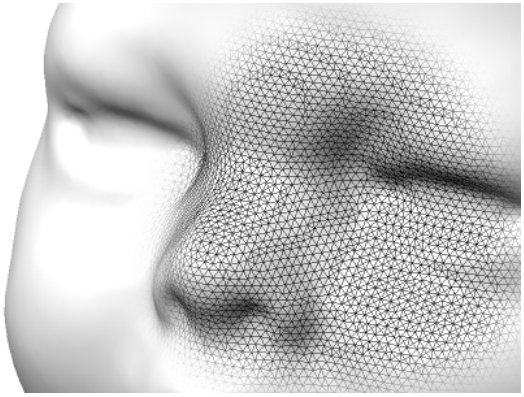
Raw scan of Doll A



Scan of Doll A with RBF software applied

RBF Simplification

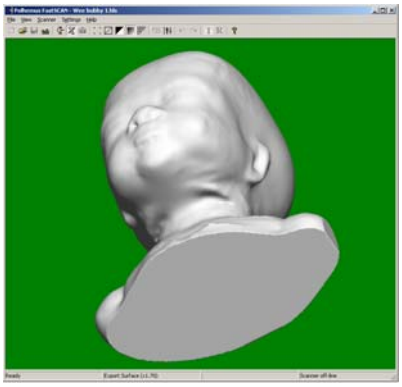
RBF simplification technique uses unique mathematical functions. Consequently, surfaces simplified with RBF are more faithful to raw scan data than other traditional methods. For example, Tru-Test used a 0.05mm accuracy parameter to create a simplified surface no further than 0.05mm from the non-simplified surface. Despite such a tight constraint, the polygon count from Doll A was reduced 82% with out much loss of detail.



Doll A before RBF simplification

Doll A after RBF simplification

Exporting Scans into SolidWorks



The Doll A exported as a closed, water-tight model, with closed planes at the bounding box at the shoulders and base.

The 3D scans were exported as IGES 128 (NURBs) entities, which is one of the many industry standard formats that FastSCAN™ supports. Then, Jeremy Palman, Mechanical Draughtsman, imported the RBF scan of Doll A directly into SolidWorks. It took approximately 3 minutes to import. The result was an imported solid model that Palman was able to start working on immediately. Importing a non RBF model into SolidWorks would have required several different methodologies to be applied to the scan before Palman would have been able proceed. Thus, the RBF software saved Palman time, without compromising the quality of the model.

The Polhemus 3D Scanning Solution

As the industry's most compact handheld laser scanner, FastSCAN™ is a fast, flexible and attractively priced system for scanning 3D objects and significantly speeds up the 3D modeling and animation processes. Instead of bringing objects to the scanner, users take FastSCAN directly to the object – anywhere in the world. Built with Polhemus' world-renowned FASTRAK® tracking technology, FastSCAN combines handheld convenience with the ability to "auto stitch" 3D models together in real-time. The scanner knows at all times exactly where it is in relationship to the object that it is being scanned. This information is transmitted to the imaging software that instantly joins the pieces into a single, exact three-dimensional replica of

the object being scanned. When you're done scanning, the files can be easily exported into nearly all leading CAD, graphics, and animation applications.

Summary

The FastSCAN™ RBF software was critical in very quickly creating accurate models that could be imported directly into SolidWorks and immediately used. Below is a breakdown of how the scanning processes worked and the amount of time each set took.

Step	Time (minutes)	Advantages
1. Scanning	5	• Handheld, so able to scan entire surface • Number of facets:141,000
2. FastRBF processing	4	• Automatic hole filling • Smoothing of noise • Water-tight • Closed surface (optional) • Number of facets: 97,000
3. FastRBF simplification	26	• Decrease number of points … • … while remaining faithful to the original model, in a way that's determined quantitatively • Plus all the features of the above step • Number of facets: 17,000
4. Export	0.01	• Export to industry standard formats
5. Importing, SolidWorks	3	• Parsing and solid model processing automatic for the closed surface

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