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Quick-Change Artists

Millit5 masters conceptual design with digital data morphing.

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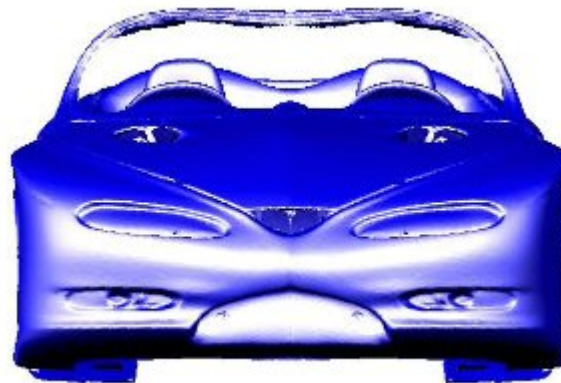
Fabrication of early-stage conceptual models and prototypes is key to efficient new product development, according to Millit5 CEO Kim Gruber.

Millit5 typically does automotive scanning and milling projects for the world's leading automakers. Gruber draws on his 12 years of experience in software development and training, Class-A surface generation, and 5-axis CNC milling studio prototypes for Ford Motor Company to provide a wide range of engineering, manufacturing, and milling studio services to his customers.

3DDDM tricks

A handy tool for assessing quick concept design changes is what Gruber calls 3D Digital Data Morphing (3DDDM) using global and local control techniques. It produces 5-axis machine data using flat-end mills to cut the hot studio clay. One data file is the foundation for quickly creating multiple design variations for studio review and clay mill back-verification. A strength of this tool is that it leverages previous product designs to bring better products to market faster.

The concept models (right) of the Ford Mustang Mach III illustrate how local and global point cloud and surface morphing can quickly generate a number of design options for management review. These models are used to enhance the communication and visualization of project design data. Potential benefits include fewer design errors, faster time to market, and higher participation of internal and external decision makers.



"Technology and software advancements are pushing 3D digital boundaries in design," says Gruber. "They require you not only to imagine the shape, but to blend design using 3DDDM reality with character and style." In the automotive world, for instance, an entire roof or "greenhouse" of a car can be raised or lowered a slight increment—hundreds of millimeters—in a matter of minutes, with all of the car's glass planes and pillars following along.

More examples of 3DDDM using the Ford Mach III Mustang appear on the [Millit Web site](#). The Mustang project shows how designers can work with a single

data set to scan, design, render, mill, and perform CFD analysis to produce desired **studio-quality work**.

Greg Arceri, a retired Ford studio manager who worked on the original Mach III, took this new-school 3DDDM modeling for a test drive. After viewing a demonstration, he found no limit on how designs could be manipulated. [Click here](#) to view his 2007 Mach III results.

In the technology toolbox

Gruber uses a Handyscan 3D laser scanner from Creaform (Levis, Canada) for reverse engineering and other applications. The lightweight, portable (2.1lb) scanner measures 6.25" x 10.2" x 8.2" and is capable of 0.002" accuracy. It creates STL files that can be exported to CAD applications for rendering, 3D videos, design reviews, CNC machining, and morphing. For some concept models, Gruber scans studio clay models to get the basic design intent and form. For others, he works with 2D centerline concept sketch images to build digital 3D studio models for milling and other analyses.



Using Millit5's 3DDDM approach, designers can quickly evaluate multiple design concepts. This example shows variations on the Ford Mustang Mach III.

ICEM Surf (Dassault; Paris, France) is used for Class-A surface modeling and for adding real-time lights, materials, textures, and shadows. Depending on the job, Gruber can do a quick Class-B surface of an STL point cloud all the way to the perfect highlights of a Class-A surface.

For milling, Gruber uses a Quintax 5 axis mill with a Fagor 8070 CNC controller from (Stow, OH) in his studio. The machine's work envelope is 5' x 10' x 4' high and uses an 8-station tool changer. It accommodates plastic, wood, tooling foam, and other materials.

Unusual uses

As you'd guess, much of Gruber's work involves vehicle concept design and CAD/CAM work across the automotive spectrum, though he believes many manufacturers can benefit from tools such as 3D scanning, milling, and 3DDDM.

During one recent work week, Millit5 scanning an entire HVAC unit for a Toyota Avalon one day. The next day was spent creating a **10-foot tall walkthrough human heart model** for an Egyptian science museum. "The free-form geometry shape of the human heart is like the Class-A surface of an automobile, with all the blends and contours that make up the car body," notes Gruber.

Another unique project was scanning a Cadillac logo to create an **8-foot diameter badge** to display at the Super Bowl XLI MVP pavilion in Miami, FL.

The extensive example galley at www.millit5.com features pictures and video that showcase Millit5's work in automotive 5-axis milling, 3D scanning, rendering, digital technology, and tooling.