Success story

T-REX

HANDYSCAN 3D

A division of Creaform inc.

A T-REX IN THE MODERN AGE

Hand-held laser scanner technology helps a Canadian manufacturer keep its vehicle's design up-to-date.

Manufactured by Campagna Corporation, (Plessisville, QC) the radical three-wheeled T-Rex is a cross between the automobile and motorcycle. With a top speed of 140 mph, it combines the power and handling of a motorcycle with the comfort and protection of a car. The designers' intent was to make a performance vehicle with stunning lines and head-turning charisma.

In 2005 the 10-year-old design needed an update, but the T-Rex team was facing some challenges. First, a 3D drawing of the body panels and trims had never been completed—only the tubular structure had been designed on 3D CAD, which would mean work would have to be done to fit panels coming out of production. In addition, symmetry was not perfect, and without 3D drawings engineering optimization promised to be a time-consuming effort.

The team elected to reverse engineer the T-Rex using the Handyscan 3D, a handheld, self-positioned laser scanner. The portable system weighs just two pounds and is comprised only of the scanner, which resembles a pair of binoculars, and a laptop computer. It does not require an external tracking or positioning system, CMM, laser tracker, electromagnetic field, etc. The scanner is portable so can be taken anywhere, and the user is able to freely move around the part while scanning.

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The scanner establishes positioning from targets that are placed on the object being scanned. A crosshair laser system containing two high-definition cameras captures data with accuracy up to 0.25mm and 0.1mm in resolution. The scanner requires only two power cords and one communication cable, and a user can learn to use the system in a day. Multiple setups necessary when using a portable arm scanner are not required.

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THE PROCESS

The T-Rex team started by digitizing the body panels to first bring them into 3D CAD. Using two cameras to position itself relative to the object, the scanner was moving using targets and triangulation in a way similar to the GPS concept: each target (placed on the object for position reference) has a spatial "signature" in x, y, z coordinates that are recognized and remembered by the software. In other words, the scanner takes pictures of the targets and assembles them in memory to know their positions in space. This resulting array of dots is similar to the array of GPS satellites which form a triangulated positioning system.

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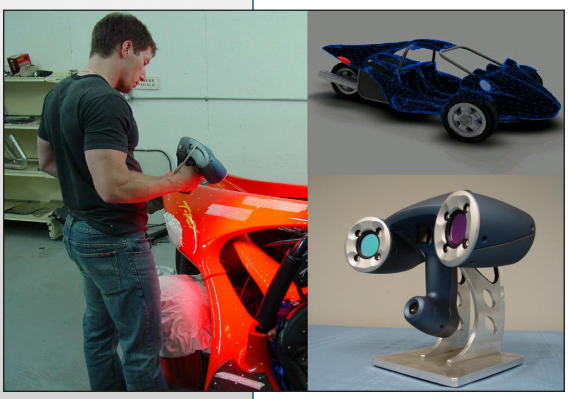
The scanner's software directly generates a surface model in real time, and the cross-beam laser frames directly create a net and allows propagation of the surface (similar to knitting). Reducing post-treatment and file size has the benefits of faster CAD surface reconstruction, thus improving project turn-around time significantly.

Having all the surfaces digitized was a first step, but there were some missing links in the 3D model. To improve ergonomics, increase design-change efficiency and create a complete finite element analysis (FEA) model of the vehicle, remaining elements such as the brake system, lights, instrument panel, seats, steering wheel, and shifter lever were also digitized.

With a new 3D model of the complete vehicle on hand, T-Rex engineers were able to improve assembly, quality control and certification. Inspecting free-form shapes in conventional CMM metrology is a challenge because of the time and difficulty of collecting the large number of points required. Laser scanners acquire tens of thousands of points every minute, allowing a precise representation of a 3D shape. Engineers are able to inspect a part for fit before it is installed.



"HandyScan 3D was a natural choice to go for this technology," says Guy Bourassa, president of T-Rex. "We had a very exciting product for our customers in the T-Rex, and we managed to bring it to an even higher level using laser scanning, CAD surfacing and analysis tools."

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