A T-Rex in the Modern Age

HANDHELD 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 an automobile and a 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, no 3D drawing of the body panels and trims had ever been completed—only the tubular structure had been designed on 3D CAD, meaning that work would have to be done to fit panels coming out of production. In addition, symmetry was not perfect, and without any 3D drawings, the engineering optimization promised to be a time-consuming effort. The team elected to reverse engineer the T-Rex using the REVscan™, 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 requires no external tracking or positioning system, CMM or laser tracker device. It can be taken anywhere and enables the user to freely move around the part while scanning.

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 and accuracy up to 0.25 mm and a resolution of 0.1 mm. The scanner requires only two power cords and one communication cable, and a user can learn to use the system in one single day. There is no need for any of the multiple setups necessary when using a portable arm scanner.

THE PROCESS

The T-Rex team started by scanning the body panels to first bring them into 3D CAD. Using two cameras to position itself in relation to the object, the scanner uses 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 position in space. This resulting array of dots is similar to the array of GPS satellites which form a triangulated positioning system.

The scanner's software directly generates a surface model in real time, and the cross-beam laser frames directly create a net and allow propagation of the surface (similar to knitting). The fact of reducing post-treatment time and files size makes CAD surface reconstruction a lot less time-consuming, thus improving project turn-around time significantly.

Having all the surfaces digitized was the first step, but some links were missing in the 3D model. To improve ergonomics, increase design modification efficiency and create a complete finite element analysis (FEA) model of the vehicle, remaining elements such as the brakes system, lights, instruments panel, seats, steering wheel and shift 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.

"We wanted to work with this new technology, and the REVscan was a natural choice for us," 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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