Case Study

Scanning Hand Impression Mould for Steering Wheel

Bloodhound SSC Project, UWE Bristol

David Huson

Context

Bloodhound SSC

Bloodhound SSC is a project to design and build a car to set a new world land speed record, the project is being run and co-ordinated by the team that built the Thrust SSC (SuperSonic Car), the existing world record holder with a speed of 763mph. Using the same driver, Wing Commander Andy Green the intention is to raise the land speed record to over 1000 mph. The machine is being built in Bristol and a fundamental part of the project is the Bloodhound Education Programme which will be available to all pupils from primary and secondary schools and to students in further and higher education, the aim is inspire the next generation of scientists and engineers.

The University of the West of England is closely involved in the Bloodhound SSC project and is leading a higher education programme BLOODHOUND @University

http://www.bloodhoundssc.com/education/bloodhounduniversity.cfm

Background

The Centre for Fine Print Research was contacted by Hywel Vaughan a University of the West of England student who is on industrial placement with the Bloodhound SSC project. Hywel had been tasked with designing the cockpit including the steering wheel for the Bloodhound SSC car.
Hywel explained that the Thrust SSC from 1997 had used an aircraft yoke to steer the car but following on from the experience of using this design it had been decided that a control system moulded exactly to the shape of the pilots gloved hand with all the switches in exactly the correct place would be needed.

Hywel Vaughan taking the clay impressions

He had used modelling clay to take an accurate impression of the pilot Wing Commander Andy Green's gloved hands and marked on the positions for the wheel controls and switches.

Having the basic form he needed to convert the shape into a CAD model so that the component could be manufactured, because the clay model was an organic shape it would have been a lengthy process to take repeated physical measurements and to draw the model in CAD so he asked David Huson at the Centre for Fine Print Research if a 3D scan of the moulds could be taken, and if a 3D model could be generated from the scan data.

The clay models were scanned, the scans assembled and refined and finished 3D stl files were returned to Hywel Vaughan at Bloodhound SSC so that the surface data could be extracted to construct a CAD file for manufacture.

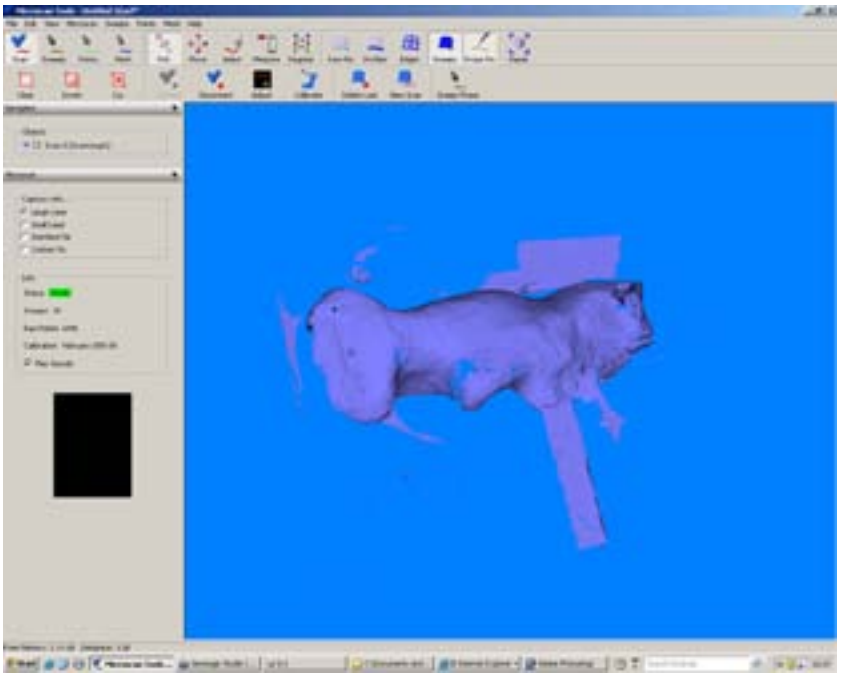
3D laser scanning the clay models

Using the Microscribe G2LX arm with the Microscan 3D laser scanner attachment the clay models were scanned on all sides and recorded as point cloud data in the Microscan software.

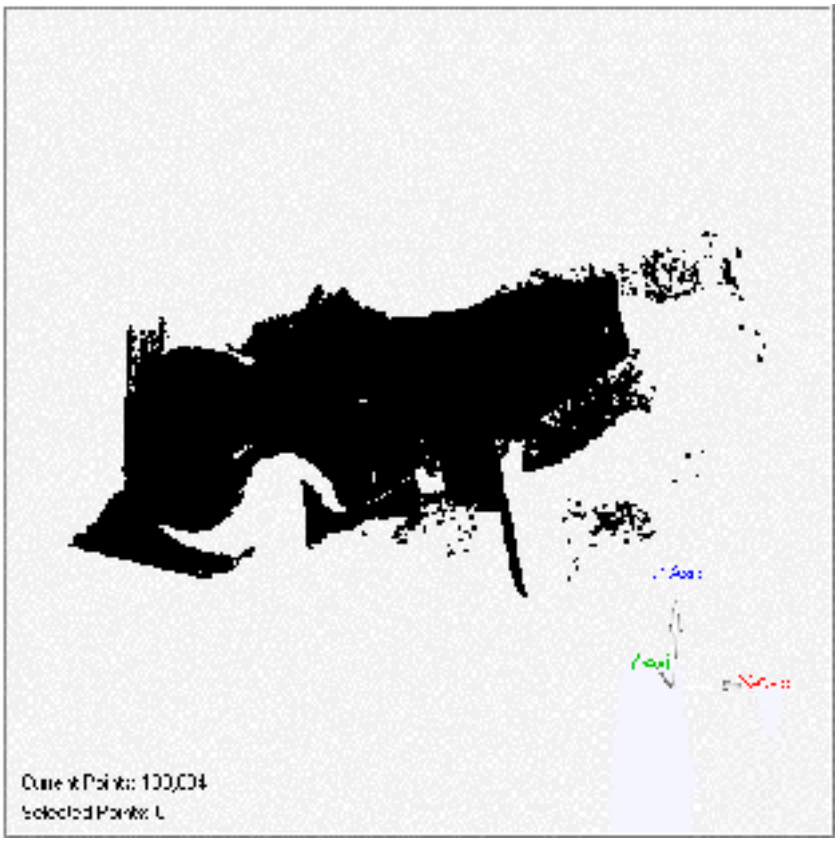
3D laser scanning the clay impression

3D laser scanning the clay impression

The laser scanner uses a laser stripe to illuminate the contours of the model, a camera built into the scanner records the position of the stripe and the encoders in the arm of the scanner allow the software to register the exact position of points of the model in space.

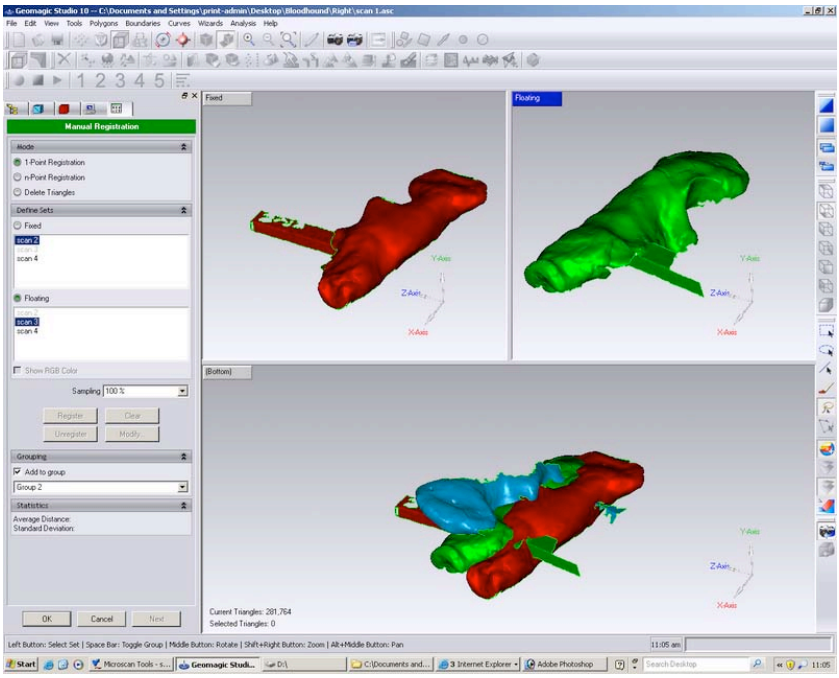


3D scan image rendered in Microscan software



Point cloud data in Geomagic Studio 10

A series of scans of both clay models covering all faces of the models were taken. The point cloud data from the Microscan was imported into Geomagic Studio 10 and converted into stl mesh files.



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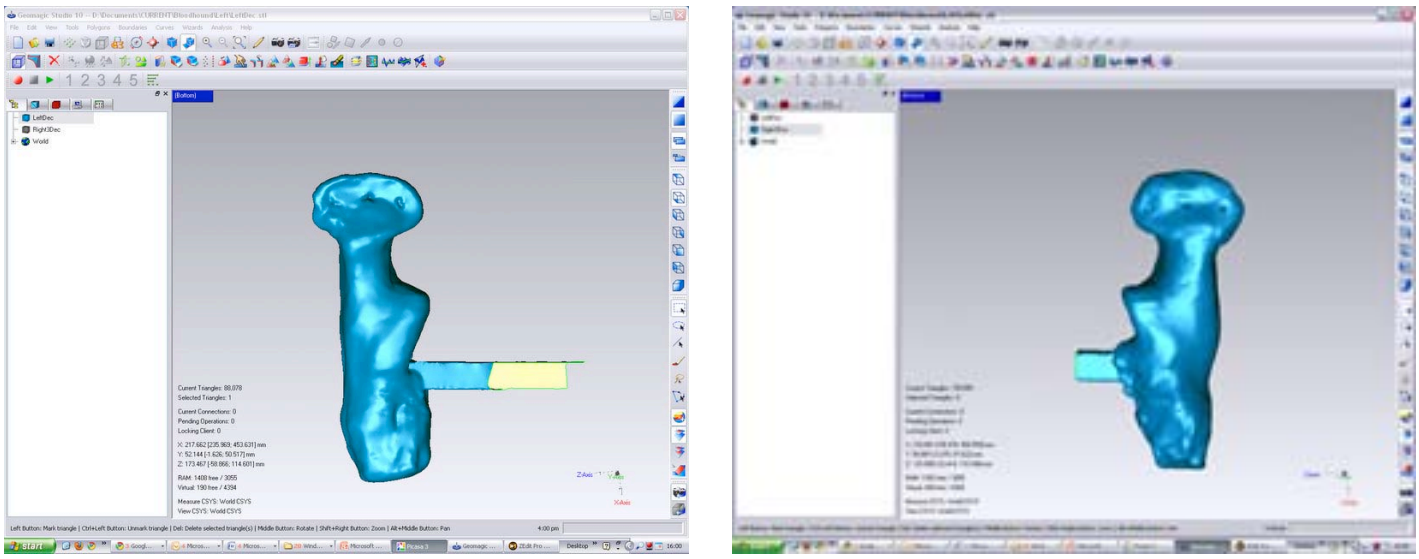
Orienting scans in Geomagic Studio 10 software

Geomagic Studio 10 has the facility to take a series of scans of an object from different angles and of different faces, to re-orient them, and then combine them into one 3D model.
This procedure was carried out, repairs were made to the mesh of the combined model and the surface was smoothed.



Finished scans left and right in Geomagic Studio 10

Links:

http://www.bloodhoundssc.com/

http://www.bloodhoundssc.com/news.cfm?widCall1=customWidgets.contentItem_show_1&cit_id=4680

http://www.bloodhoundssc.com/news.cfm?widCall1=customWidgets.contentItem_show_1&cit_id=4673