

V-STARS Demonstration Results Report



Table of Contents

Objects Measured	2
Equipment Used	2
Minivan Measurement.....	3
Objectives	3
Targeting	3
Measurement Statistics	3
Alignment	5
PRO-SPOT Data.....	5
Numbering Guide	6
Analysis.....	6
Time Summary.....	7
Car Seat Measurement.....	8
Objectives	8
Targeting	8
PRO-SPOT Data.....	8
Numbering Guide	11
Time Summary.....	11
Concluding Remarks.....	11

Objects Measured

Two objects were measured as part of the V-STARS demonstration. They are shown in the adjacent diagrams.

The first measurement undertaken was on an Minivan.



The second object was a cloth car seat.

Refer to the Measurement Report for more information on how the measurements were undertaken.



Equipment Used

1. V-STARS S6 INCA Camera System.
2. V-STARS D1H Camera System.
3. PRO-SPOT Target Projector.
4. 5600 point projection slide.

Minivan Measurement

Objectives

1. Demonstrate D1H camera use and object targeting.
2. Compute key circles on wheels to align car.
3. Determine location of points along window and doorsills.
4. Measure part of the car surface using 5600 point slide and INCA S6.

Targeting

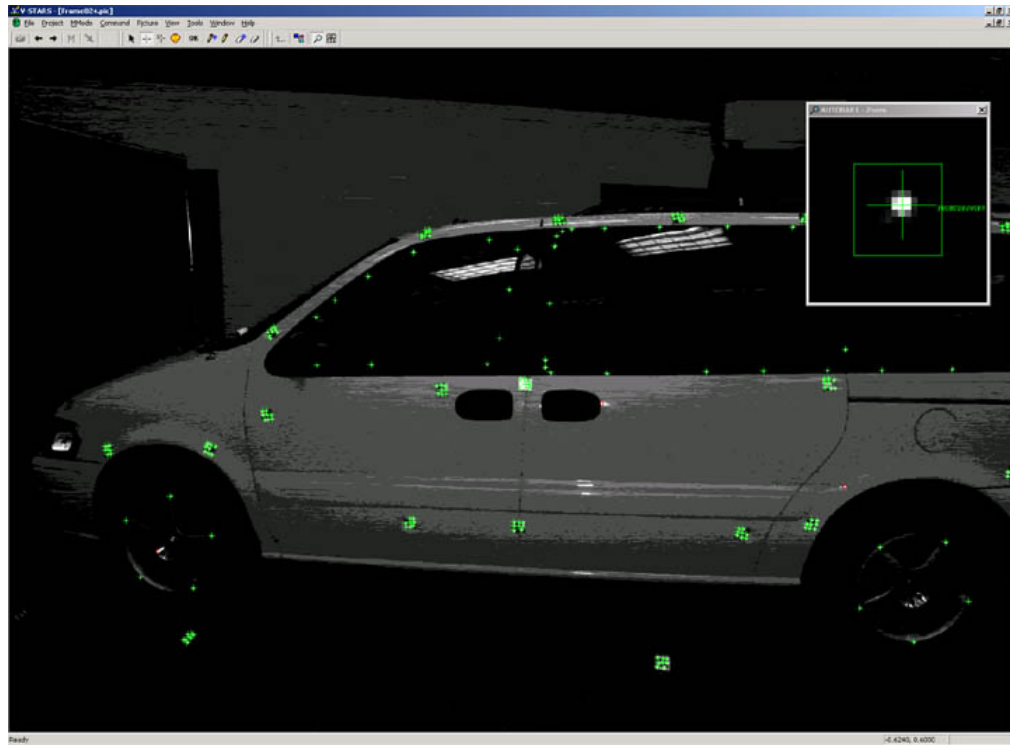
1. AutoBar for initial coordinate system.
2. Coded targets to tie photography and PRO-SPOT patch together.
3. Scale bar to scale the network.
4. Individual targets to define areas around the windows and door sills.
5. Individual targets to define each of the wheels.
6. Targets generated using the PRO-SPOT projector and target slide.

Measurement Statistics

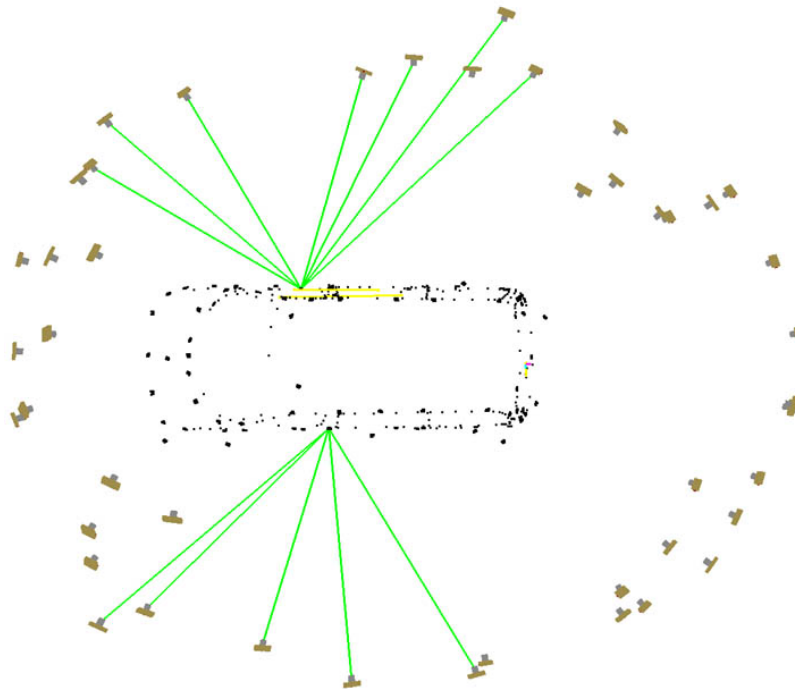
Initial Control Network

No. of photos	49
No. of points	835
Number of scale bars	2
Scale Agreement	0.026mm
Accuracy RMS X,Y,Z	X 0.029mm
	Y 0.025mm
	Z 0.038mm

A typical measurement image from the initial control network is shown in the image below.



The geometry used to create the initial control for the measurement is illustrated in the image below. Also shown are examples of rays of intersection.



Alignment

The center point of each of the wheels was computed. The mid-point of the front wheels was defined as the origin. The X-Axis ran along the length of the vehicle. The Y-Axis ran from the driver to passenger side and the Z-Axis was positive up. The alignment is shown in the image below.



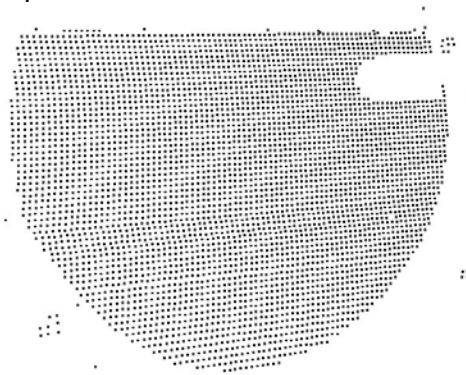
PRO-SPOT Data

A portion of the car was covered with one set up of the projector with the 5600 point slide.

PRO-SPOT Results

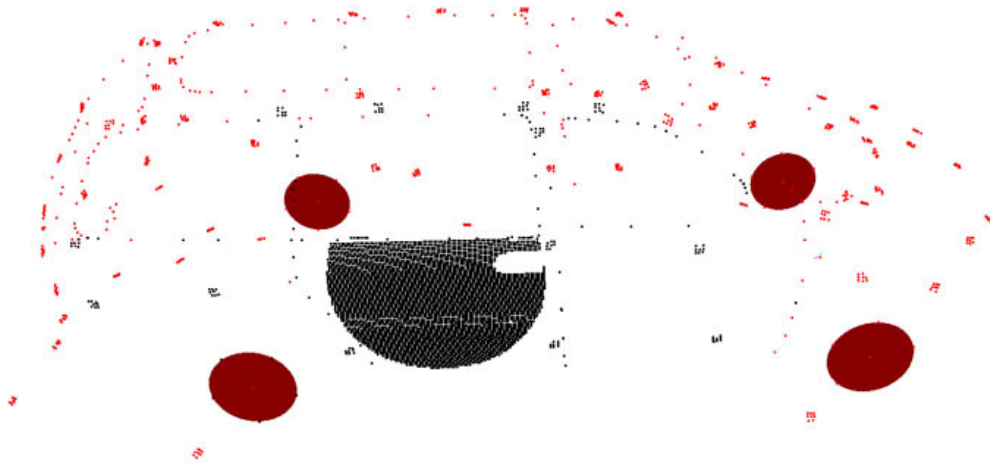
No. of images		13
Total number of points		4234
Accuracy RMS X,Y,Z	X	0.014mm
	Y	0.007mm
	Z	0.010mm

The diagram below illustrates the PRO-SPOT patch that was collected.



Note that the data around the handle is missing. This is due to the fact that the handle is black while the rest of the door is white. If the handle was needed in the measurement then it would be necessary to adjust the power of the projector to get more light return off the black surface.

The PRO-SPOT data was combined with the original car data. The common coded targets were used to transform the patch into the car coordinate system established earlier. This is shown in the image below.

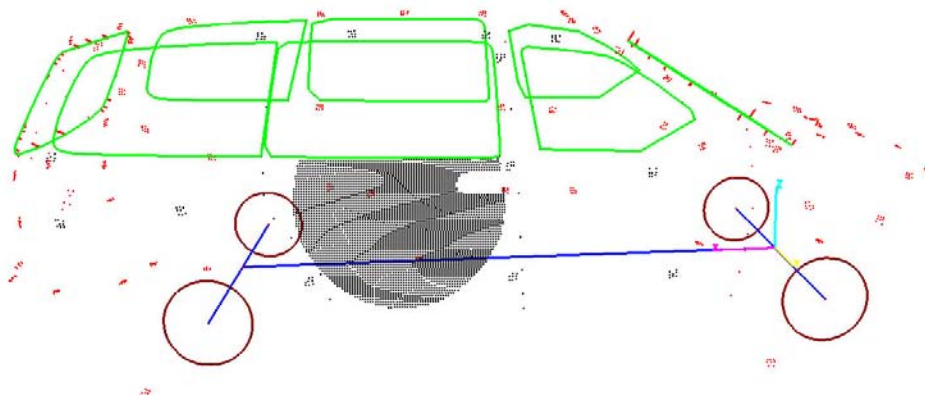


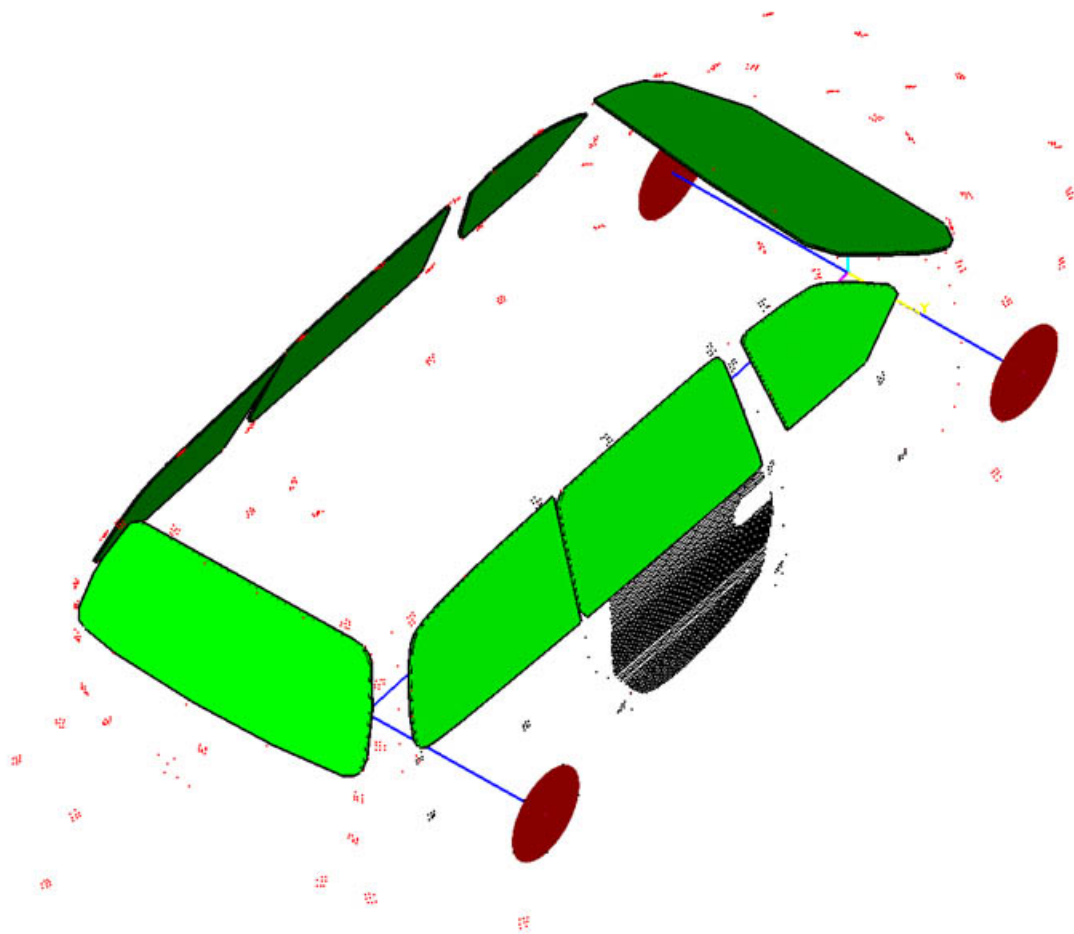
Numbering Guide

- Individual points in the key areas were given unique labels to assist with analysis.

Analysis

The data that was collected was used to create planes through the key areas.





Time Summary

Control Targeting	10minutes
Control Photography	5 minutes
Control Processing	10 minutes
PRO-SPOT collection	5 minutes
PRO-SPOT Processing	5 minutes
Analysis	10 minutes
Total	45 minutes

Car Seat Measurement

Objectives

1. Collect multiple data sets to completely define a cloth car seat.

Targeting

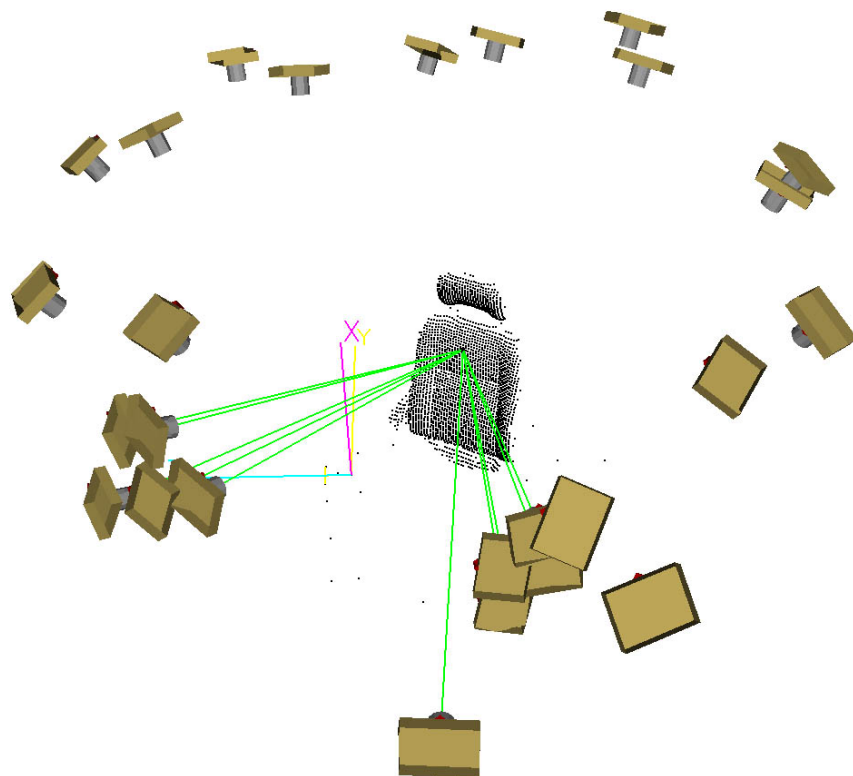
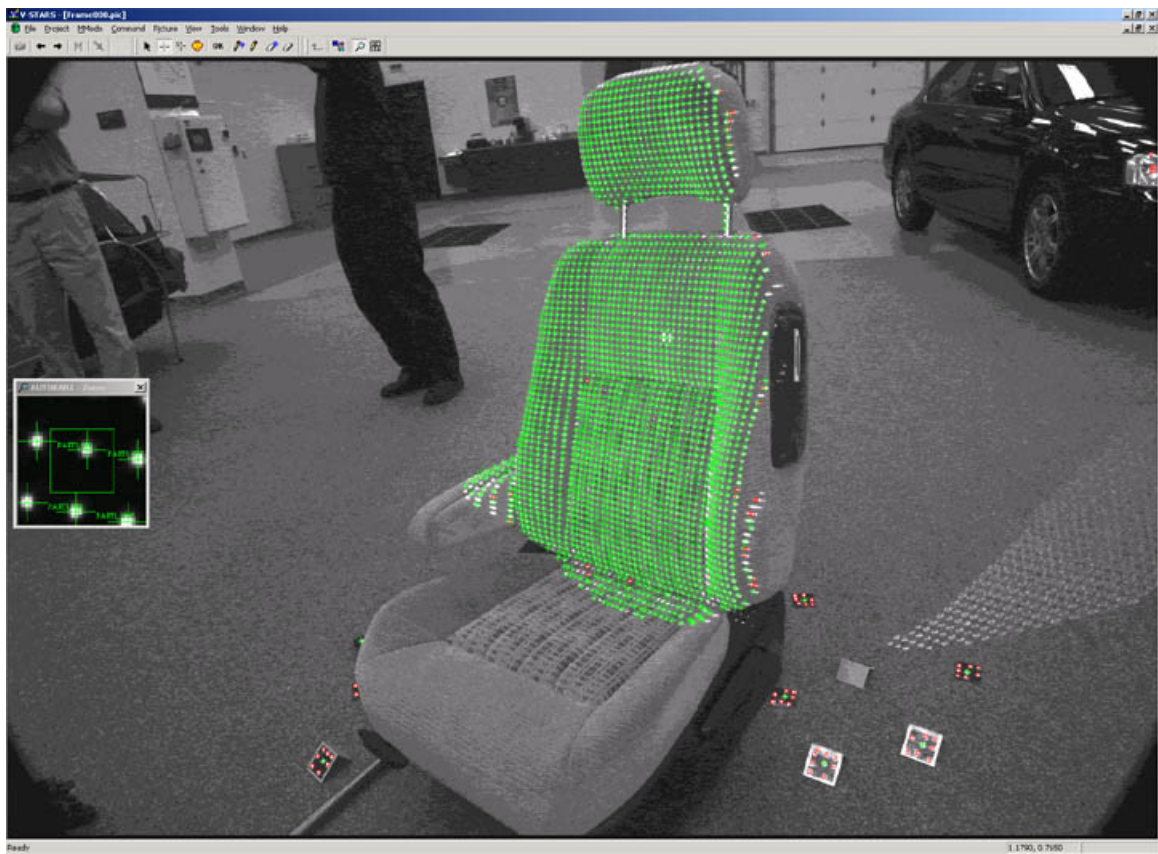
1. AutoBar for initial coordinate system.
2. Coded targets to tie photography and target patches together.
3. Scale bar to scale the network.
4. Targets generated using the PRO-SPOT projector and target slide.

PRO-SPOT Data

The seat was covered in seven set ups of the projector with the 5600 point slide. Each patch was measured using the single camera system. Using this method, each patch was collected in about five minutes.

A typical setup, measurement image and measurement geometry are shown in the images below.

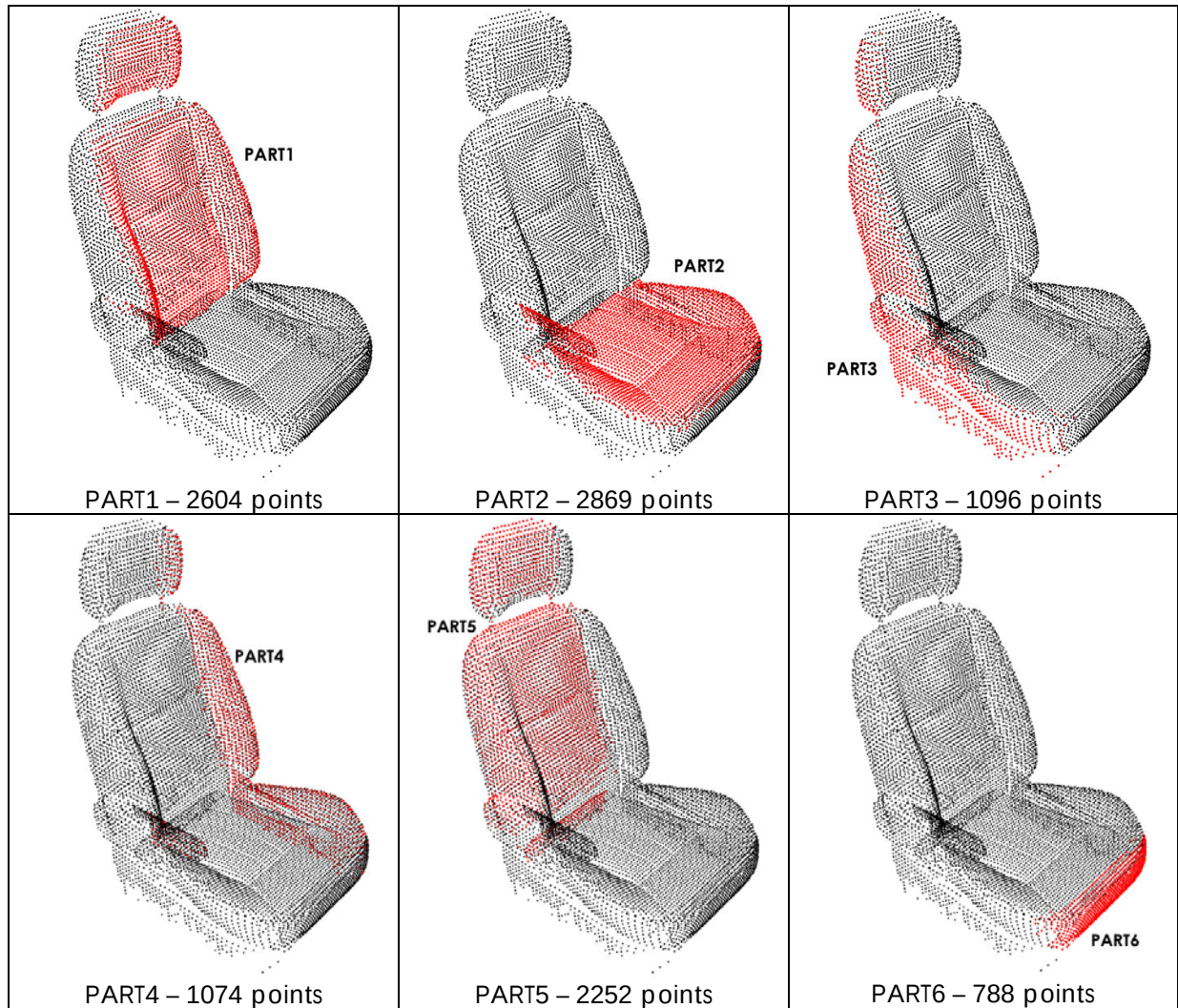


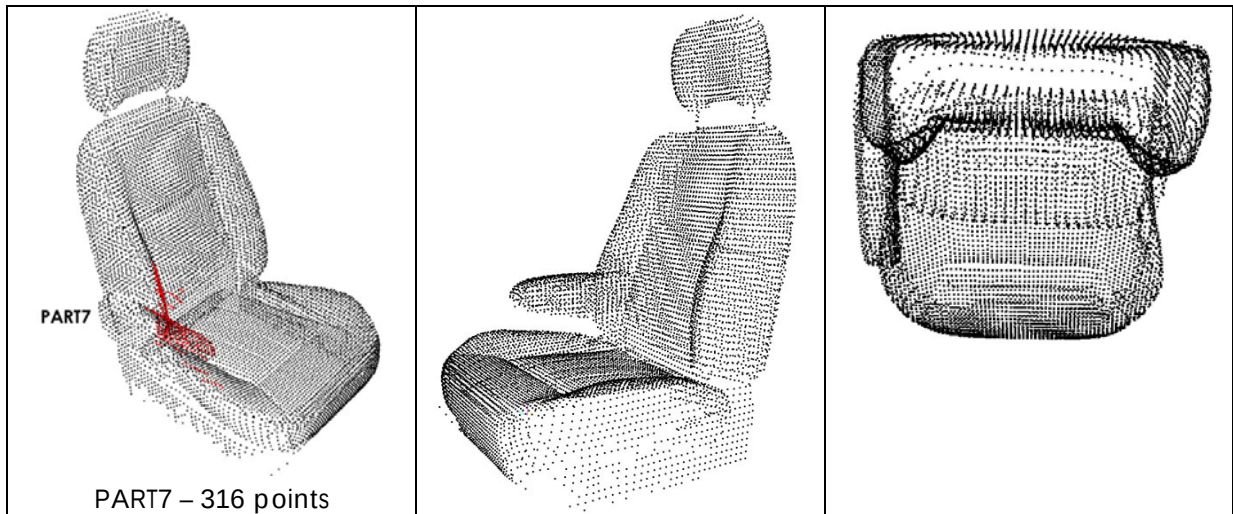


PRO-SPOT Results

No. of parts	7
Total number of points	10822
Accuracy RMS X,Y,Z	X 0.015mm
	Y 0.017mm
	Z 0.017mm

The diagrams below illustrate the PRO-SPOT patches collected and their location in relation to one another.





Numbering Guide

- Individual points in each PRO-SPOT part were named PART1_??, PART2_??, etc. etc.

Time Summary

Control Targeting	5minutes
Control Photography	5 minutes
Control Processing	5 minutes
PRO-SPOT Data Collection	45 minutes
PRO-SPOT Data Processing	25 minutes
Analysis	5 minutes
Total	90 minutes

Concluding Remarks

The measurements undertaken have shown that V-STARS with the INCA or E3 system and PRO-SPOT projection system can be very powerful measurement tools. The results of the measurement undertaken were very accurate and more importantly were produced quickly.