

3D scanning industrial application.

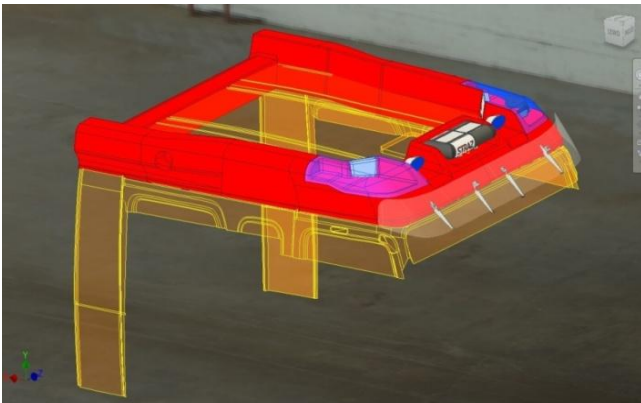
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This article presents possibilities of using 3D scanner in industrial sectors - precision engineering and automotive. Based on Reverse engineering and CAD modeling of scanned in 3D - items and parts of the fire truck cabin. Because of the lack of cabin documentation, restoration activities described below are crucial. CAD modeling based on 3D scans are presented step by step through 3D data acquisition using SMARTTECH 3D scanner scan3D DUAL VOLUME finishing on obtaining CAD model using Geomagic Design X

KEYWORDS: 3D scanner, scan3D DUAL VOLUME, SMARTTECH, CAD, reverse engineering, model

The main goal of measurement using scan3D Dual Volume is recreating CAD model of a real truck cabin and based on that making a technical documentation[3]. Such model is essential to design fire truck body and its accessories that will be implemented on a cabin[4].

Main problem which we shall concern is design by itself. Using 3D scanned cabin we are ready to create the rest of the vehicle keeping its cohesion and modern look.



Rys. 1. Wizualizacja zaprojektowanych części.



One of the examples of modeling in this exact case are specialized lamps, and horns with their streamline shaped covers. Moreover CAD design can ease assembling of such parts. Using digital model we can predict where potential problems can appear, and rapidly avoid them by relocating or resizing assembly holes or adapt other parts.

To prepare CAD model we must:

- a) scan the object in 3D - it will be presented in software as a pointcloud
- b) Convert pointcloud in to triangle mesh,
- c) Design surface using triangle mesh

In this example we present the process of 3D scanning and method of surface modeling in order to make a technical documentation.

All together we made over 50 scans using SMARTTECH 3Dmeasure software. Further postprocessing was done in Geomagic Design X.

Working in SMARTTECH3D measure software.

Having all results of 3D scanning using positioning markers we are starting initial cleaning of noises that could appear during measurement process.

3D scanning - gathering element geometry.

In first part we scanned a part of cabin, in details - it's roof and connection between cabin and technical facilities using 3D scanner with white structured light. In order to receive better results object was sprayed with antiglare agent and positioning markers.



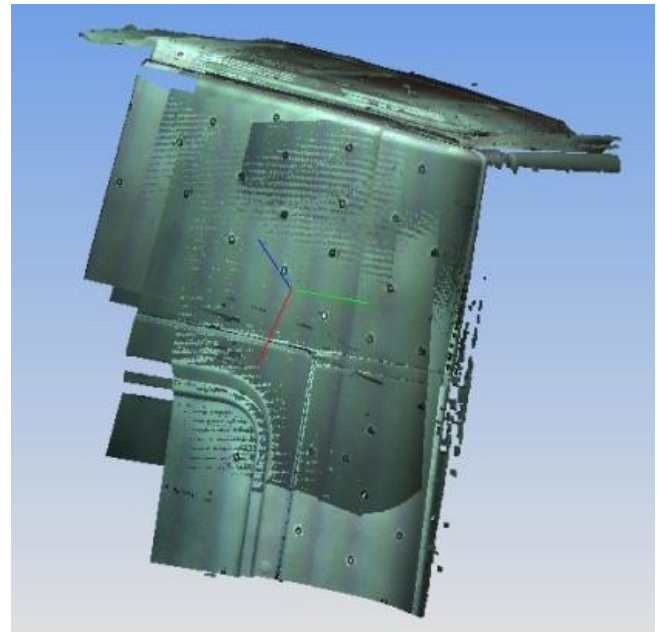
Pic. 2. Object coated with antiglare agent and positioning markers.

For scanning we used 3D scanner from SMARTTECH - scan3D DUAL VOLUME, which features two independent measurement volumes: Big one 800x600x350 with 5 Megapixel resolution and accuracy of 0,1mm to scan the whole object rapidly and 300x200x210 with 10 Megapixel Detector and 0,06mm accuracy to scan important details with higher precision.



Pic. 3. Scan3D DUAL VOLUME.

Result of a single scan is a pointcloud (where every point is described with X,Y,Z coordinates)

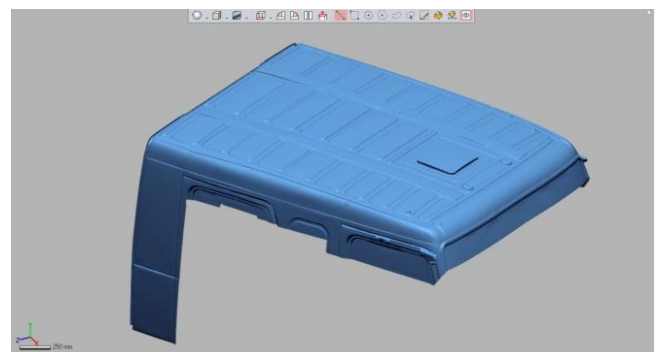


Pic. 4. Sample pointcloud in SMARTTECH3Dmeasure.

Thanks to many different tools and filters of the software such process is done automatically. Afterwards we are creating triangle mesh on which we will create our CAD model.

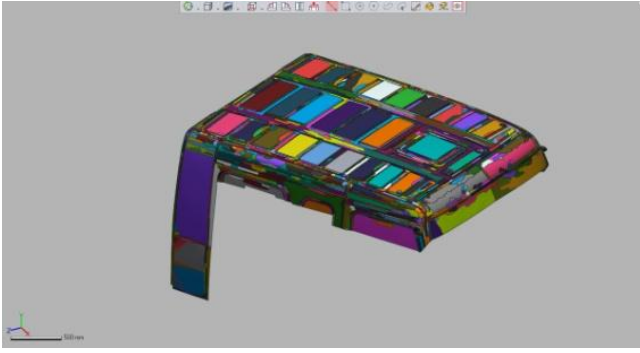
Creating Surface model in Geomagic Design X.

Next stage is to Import Triangle Mesh to Geomagic Design X software[7]. To improve it's quality for further modeling, we decreased the number of triangles in Mesh in places where geometry does not change, and increased them on curvatures and other important for CAD places.



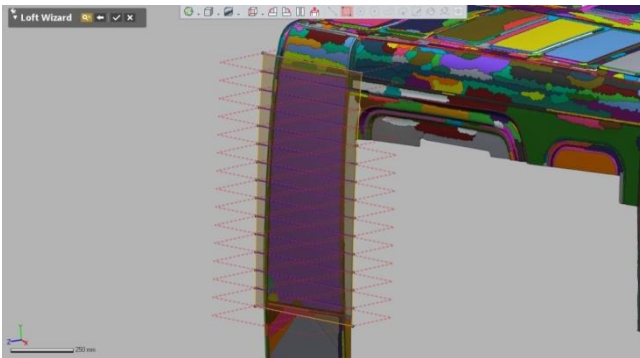
Rys. 5. Siatka trójkątów.

Next we create regions - Triangle mesh areas that makes a parts of surfaces like planes, cylinders, cones, balls, turns and single planes. These regions help us in further modeling. We use regions for coordinate system recognition



Rys. 6. Regions in Geomagic DesignX.

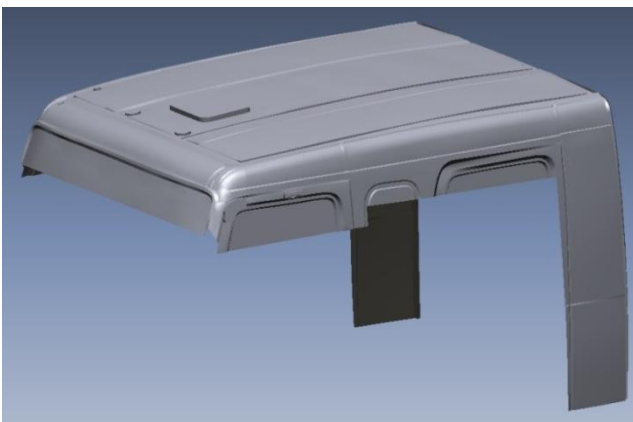
Further step we start to design surfaces. Most of the model is created by regions and surface modeler we create patches which will create surface model after proper connection and crop.



Pic. 7. Creating Surfaces.

During adjusting the surfaces the software allows to provide accuracy analysis - in other words- to check the difference between surface model and triangle mesh visualisted by colorful map of deviations.

What's important - Geomagic Design X allows you to copy tree of taken operations to other CAD programs like Solidworks, CATIA, and NX. Finished model can be saved in many different formats like IGES, Parasolid or STEP.



Pic 8. Firetruck cabin CAD model.

Summary

Provided measurement shows how 3D scanning can ease re-modeling proces. For measurement we used 3D scanner Dual Volume and results of scans was a pointcloud based on which we made CAD model of firetruck cabin.

This model will be send by engineers who will use it for further modeling.

Thanks to SMARTTECH 3D scanner and specialized software like SMARTTECH3Dmeasure and Geomagic Design X it is possible to create full CAD documentation (CAD model)

Created CAD model was used to:

- device designing,
- designing additional elements,
- develop production technologies,
- Develop a method for assembling elements.

Industrial 3D scanning appliaction is very wide and open new possibilities. Using it we are able to make a CAD model just like it was described above, and thanks to that we can design new elements that will fit to existing ones. We can save money and time spend on creating prototypes without a risk of damaging remodeled object.

SMARTTECH 3D scanners are being used also in medicine and archeology where customers are more than satisfied; of scanning process as well as it's possibilities.