

RC20872

Complete workflow for 3D laser scanning of large plants (>20.000 m²)

Tom Traen
Industrial Engineer
Sicoplan NV

Merijn Vanalderweireldt
Head of design department
Sicoplan NV

Learning Objectives

- Capture point cloud with Faro X130 and process large laser scanning dataset in Faro Scene.
- Smart cleaning and splitting of large point cloud into manageable datasets in Autodesk Recap and Navisworks
- Combine scanned data with 2D/3D models, perform collision detection and create movie of high quality in Autodesk Navisworks.
- Combine laser scanner point cloud with photogrammetry point cloud derived from drone.

Description

Sicoplan NV is a Belgian engineering company and is part of the German Siempelkamp group. We are responsible for the design of large plants in the wood based panel industry, which are located worldwide. For brown field projects we use a laser scanner to improve our engineering capabilities. This class will explore the implementation of an efficient workflow for 3D scanning of large plants. From laser scanning on site to manageable point cloud datasets, which can be used during engineering in 3D. Our scan projects count regularly more than 100 scans and cover an area of more than 20.000 m². After the scans are captured, the scans are stitched together with Faro Scene software. The derived point cloud is then cleaned and split into layers in Autodesk Navisworks and Recap. Those clean scans are then combined in Autodesk Navisworks with 3D models of the new equipment, this combined model is an important asset to evaluate the feasibility of our solutions. At our office we use Autodesk Inventor to create the 3D models. Collision detection can be executed in this model with Autodesk Navisworks Manage. Our workflow has been improved a lot since we started, and this is what we want to teach in this class. Recently we purchased a drone to capture photos at places that are not reachable for our scanner (for example, ducting on a roof). A 3D point cloud can then be derived from those photos and combined with the laser scan point cloud. Drone reality capturing has also other advantages (and disadvantages) in comparison with laser scanner, which will be discussed during this class. This session features Faro Scene, Autodesk ReCap, Autodesk Navisworks Manage and Simulate and Autodesk Revit.

Your AU Expert(s)

Tom Traen

Tom.traen@sicoplan.be

Tom is 26 years old and lives in Belgium. He recently graduated from the University of Ghent (Belgium) with a degree in industrial engineering after previously obtaining his electro technical engineer diploma. He has been working at Sicoplan for a year. One of his responsibilities is the development of an efficient workflow for 3D scanning of large plants situated in the wood-based industry. He has already done 7 projects across the world and wants to share his experience in this class.

Merijn Vanalderweireldt

Merijn.vanalderweireldt@sicoplan.be

Merijn is 31 years old and lives in Belgium. He graduated from Ghent University (Belgium) with a master degree in industrial engineering. He has been working in Sicoplan for 7 years. He is responsible for all engineering workflows and methodologies used by the design department. He did several projects involving Autodesk Products with as main goal the overall improvement and broadening of engineering services provided by Sicoplan. He was responsible in the 3D scanning project to integrate these new scanning methodologies in the existing engineering trajectories.

Capture point cloud with Faro X130 and Process of large laser scanner datasets in Faro Scene

The plants we need to scan are complex environments. They contain large steel structures (up till 60 meters high), ducting across the plant, complex machinery... On average we need about 100 scans both in and outside and also on different levels. A Faro X130 laser scanner is used to capture the data. In this class we will talk about the preparation of a laser scan project, travelling worldwide with a laser scanner and accessories, and finally capturing the point cloud at the plant. The processing of the data already starts after the first scans were captured. For stitching the scans we have tried two different software packages. Autodesk Recap delivers good results for smaller projects, but the possibilities are limited. Faro Scene offers more possibilities, which we need to stitch the scans of our complex environments. Therefore we have chosen to make use of the Faro Scene software. This workflow ensures when we arrive back at the office, our 3D point cloud is already stitched together. The 3D point cloud is then further processed at the office with Autodesk Recap.

Smart cleaning and splitting of large point cloud in manageable datasets in Autodesk Recap and Navisworks

Our 3D point clouds are between 50 GB and 200 GB large. We will discuss the desired computer specifications to handle this large files. These large datasets are difficult to work with, therefore we always split our point cloud into layers. How the data gets divided is determined by the scope of the project. In this manner each designer has only to place the scans on his computer of the area where he has to model a new part. It seems an easy job, but if it is done in the wrong manner it can cost a huge amount of time. We have developed an efficient workflow making it possible to split a scan in more than 100 layers in only a few days. The layered scans are not a final deliverable for our customer, but are needed to support our design process.

Combine point cloud with 2D/3D models, perform collision detection and export movie of high quality in Autodesk Navisworks.

Combine point cloud with 2D layout and 3D model

Our layered point cloud can finally be combined with a 2D layout and 3D model in Autodesk Navisworks. Each separate layer and each part of our model can be loaded in Autodesk Navisworks and will be automatically in the right place. We will teach how this can be achieved. This is already one advantage of the layered point cloud. If the customer or engineer wants to look at only a part of the total plant, he only loads the concerned part of the model and the concerned part of the scan.

Collision detection between point cloud and model in Autodesk Navisworks Manage

A very nice feature of Autodesk Navisworks Manage is collision detection. We will demonstrate how this feature works with point clouds and how it can be used to save a lot of time for checking the accuracy of our model. The layers of our point cloud makes the collision detection process clearer.

Create sections in Autodesk Revit

A 3D laser point cloud is very beautiful, but a 2D drawing sometimes provides more insight than a 3D model. Some people also like 2D drawings more than 3D models. There exist different tools to achieve this, but we will show how to do it Autodesk Revit.

Export movie of final result in Autodesk Navisworks

Some of our Navisworks model are up to 50 GB in size, which may present some problems. Sending a 50 GB data file via the internet to the customer is not always easy. The second problem arise that some customers are not versed in navigating into a 3D model. That is the reason we always deliver a movie of the final result, which is easy to understand for everyone. In this part some tips and tricks will be learned to make quality movies using point cloud data of the Navisworks model.

Combine laser scanner point cloud with photogrammetry point cloud derived from drone

Recently we bought a drone, a 3DR SOLO, to expand our reality capturing possibilities. The result is also a point cloud. Depending on the time remaining, we will discuss the differences, advantages and disadvantages of photogrammetry to laserscanning and provide some insights on how you can combine data gathered by laser scanning with data gathered from a drone taking pictures. We will report and show our provisionally results achieved up till now.