Artec 3D

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Artec LEO

Scanning Large Objects with Artec Leo

English
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Goal of this document

If we need to scan smaller objects – let's say up to about 1 meter in size – then we usually don't have to worry about a structural way of working.

We are always in favor of "thinking about how we are going to scan", but with objects of these dimensions you usually don't get into trouble if you don't do this.

This story becomes completely different when you have to scan very large objects! Then you suddenly must deal with an enormous amount of data, where the computer is unable to process all this data at once.

We now must start thinking about "data management", in other words: how should I scan and how can I process all the data I have stored into a nice model and also in an acceptable time?

That is what this document is about, and we provide guidance for these situations.

The document is divided into four chapters:

1. Examples and the Plan of Attack.
2. The organization during the scan?
3. The way of post-processing (post processes).
4. Further advice.

Good luck scanning your Large Object(s).

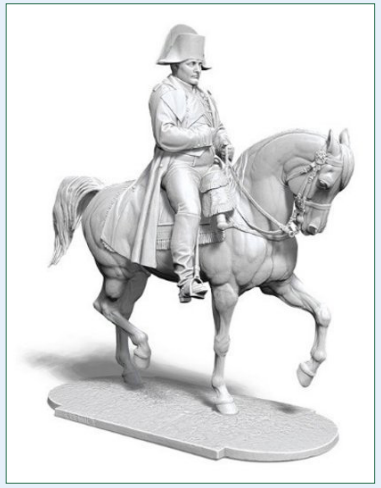
Team 4C

01.
1. Examples and the “Plan of Attack”

When you have to scan a large object (e.g. a statue like the one on the right), you must think about the approach in advance. Scanning everything at once is impossible. But how can we do this? The advice is: Make a “Plan of Attack”!

Here are a few examples where this was necessary and has been applied.

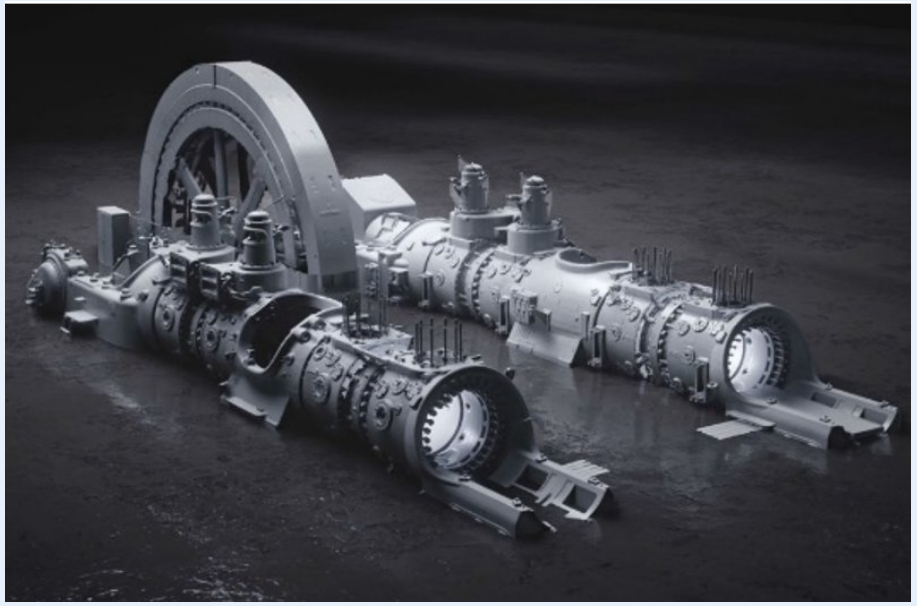
This statue was scanned by a French Artec user and before he started, he has divided this statue of Napoleon on horseback into 18 pieces, so 18 different projects. This has been done with the EVA, but the principle remains the same. There was 57 Gb of data – and especially with the EVA this is a lot.



The whole story can be read here:
https://www.artec3d.com/cases/napoleon-monument-scanned-artec-eva

Also, when this helicopter was completely scanned, a plan was drawn up in advance about how it would be scanned. The Artec Ray and the Artec LEO were used in this scanning project. Beforehand they thought about what to scan with the Ray and what with the LEO, and here too the scanning is divided into “projects”.

Here is also a link to the complete story:
https://www.artec3d.com/cases/air-rescue-helicopter



This is a huge object, an old gas turbine from a power plant in Luxembourg. Total length is 26 meters, and the flywheel is 6 meters high. Here too, a combination was made with the Ray (18 scans) and the LEO scanner (67 scans). Total project size 186 Gb of which 170 Gb was scanned with the LEO. Transferring the data alone took about 5-6 hours.

The link to this story: https://www.artec3d.com/cases/luxembourg-gas-engine

The most important thing in these large projects is that we realize that a huge amount of data is generated and that means that a lot of data must be transferred and that we have to take into account relatively longer computing times.

We would like to keep these times as short as possible. The speed of the computer will therefore also be very important, but the most important thing is that we think about the approach and make sure that we keep the data workable. We do this by dividing the project into "sub-projects" in advance, each of which is fairly quick and clear. In the statue of Napoleon, for example, each leg is a separate project and the tail etc. This is thought out in advance **and executed in this way!**

This is the Plan of Attack!

02.
The organization **during** the scan?

Scanning trajectory › So, when we have the **Plan of Attack** (so each leg is a separate project at Napoleon), then we also have to think about **how we are going to scan**. In other words: which trajectory do I think I will take while scanning, so that I don't scan things twice or three times! So be efficient.

Setting Leo

With the LEO it is very important that the setting "Optimize Project Size" is checked (active). We can find this at **Settings › Scanning** on the LEO. LEO "knows" whether something has already been scanned and will save it as little as possible multiple times. Leaving this setting **on** at all times is the advice!

Size of a Project

With the LEO we then have the choice whether we **put many scans in one project** or whether we split it **into several projects**. It is advisable to start a new project on the LEO scanner for each part you are going to scan. In the horse e.g. Project "ForelegLeft" and only the scan(s) of this leg. Then a new project "ForelegRight", etc.

The number of planned projects depends mainly on the size of the object!

The reason for this is that when loading projects into Artec Studio, we can only read in **Complete Projects** and **cannot load** a selection within the project. That's why it's important to start thinking about the size of each project now!

Size of individual scans

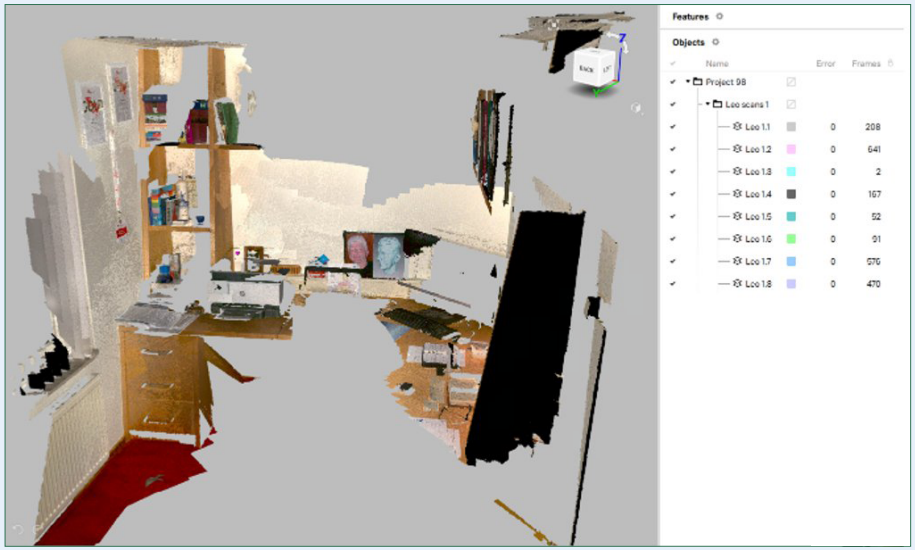
It is also very important not to let scans **exceed approx. 2000 Frames to a maximum of 3000 Frames**. Experience shows that larger scans are more difficult to handle and that any wrong frames are therefore more difficult to detect.

In the window of the LEO you can follow how far you are. At the top right you see "Frames" and when you're at 2000, it's time to think about stopping at a logical place. Then start a new scan, with **sufficient overlap where necessary** to be able to align properly!

Now we have **two choices**:

Choice 1.

When scanning, press **Stop**! And then press Start again.



What happens is:

- A **New Scan** is created that is aligned with the previous scan.
- The screen then says: “Point at scanned area” and as soon as the LEO recognizes the image: “Ready to scan”.
- These become visible as **separate scans** in Artec Studio after loading (see 8 scans above).
- This is not visible on the screen of the LEO. These 8 scans are all under “1” in this example.
- With this way of working, the counter for the Total number of frames **does continue**! In this example, the total number of frames in the LEO window **was 2207**.

Choice 2.

The other option is that you choose “Add Scan” and then the screen will also say “2” etc. However, these scans are **not** aligned with the scan(s) in “1”!

Note

We recommend that a complete project should not exceed approx. 10 Gb of raw data.

03.
How do we post-process this data

So now we have a series of scans of a large object, and we have classified these scans in a logical way according to our **Plan of Attack** and on the LEO we have also given them a logical name.

Because we have already divided the total scan into separate **Projects** during the scanning, we can now choose in Artec Studio which projects we want to import first.

We can now also decide – again entirely based on the file size – how many **separate files** we are going to create. We don't have to cram all the data into **one huge file** and with a 170 Gb project of the gas turbine, for example, that is also impossible!

So, we must do this differently

At the statue of Napoleon, for example, we could decide to import the scans of the four legs, together with the belly of the horse (the belly was also a separate project on the LEO).

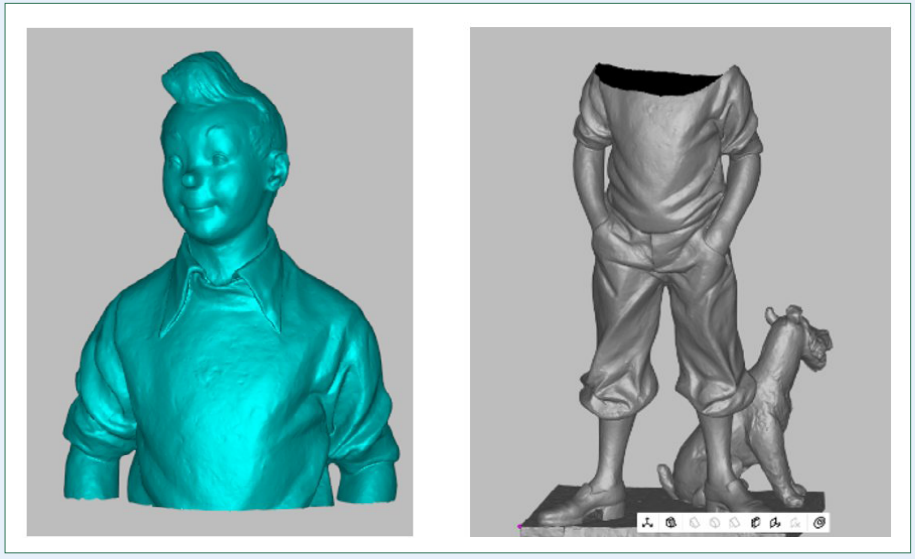
We do this and no more, because our total file size is then about 10 Gb, and we can align this data well with each other.

Steps

1. In this file "Legs Horse", we are going to do all post-processing as we always do: Global, alignment, Global, up to and including the Smart Fusion. We must also decide here what resolution we use with the Fusion. The default value is "1", but with objects of multiple meters in size, the details usually do not have to be displayed so finely. A value of 2 or 3 or even larger is usually doable and saves calculation time and size of the Fusion. We export this Fusion as an STL file!
2. We **close this file** and **start a new file** containing e.g. **the head and neck**: we export the result as an STL file.
3. Do this for all parts of the object. The result could be **7 STL** files of the complete statue.
4. We have also made sure that we **have made all scans sufficiently large with ample overlap** so that the scans can be properly aligned with each other.

5. Now, we open a **new file**, and we import **all** the STL-files of the statue.
6. If the STL files are not yet aligned, we will do so now.
7. We are now going to slice all the STL-files so that they just don't touch each other anymore. We are going to clarify this with another example, a **statue of Tintin**. Here are the different steps.

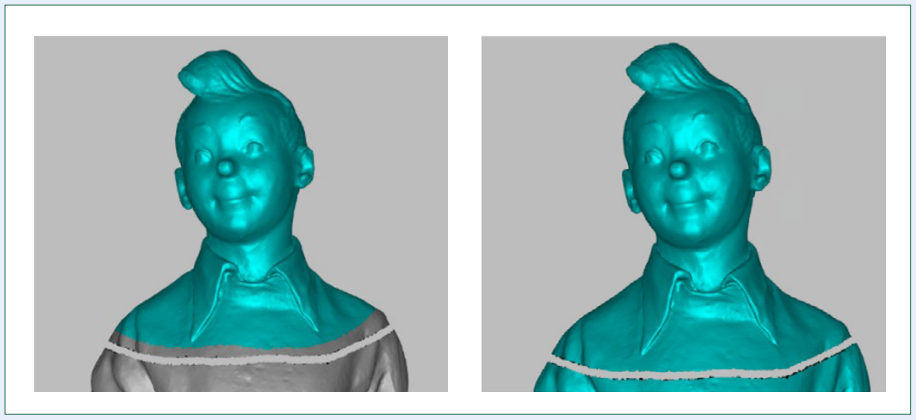
The scan of top image and the scan of the headless image



The two scans aligned with each other

Then use the Eraser (**with Select Through**) to slice through **both** of the scans at the same time as shown on the right. Make the gap as small as possible – so the size of the Eraser as small as possible!

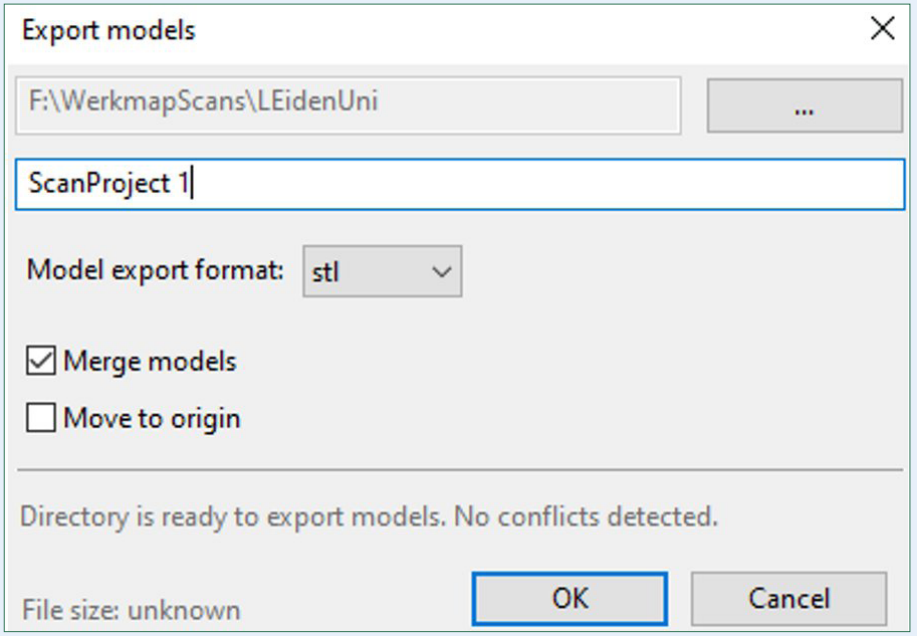
bottom right the result of the blue and grey scans. Now erase the parts per scan that you don't want to keep.



This is the result: two scans that no longer overlap, but between which there is a (minimal!) gap.

Do this with **all** of the STL-Files.

When this is ready, we want to fill the gaps again. That is not possible at this moment, because Artec Studio sees the parts as separate items, so still as a gray and blue STL file.

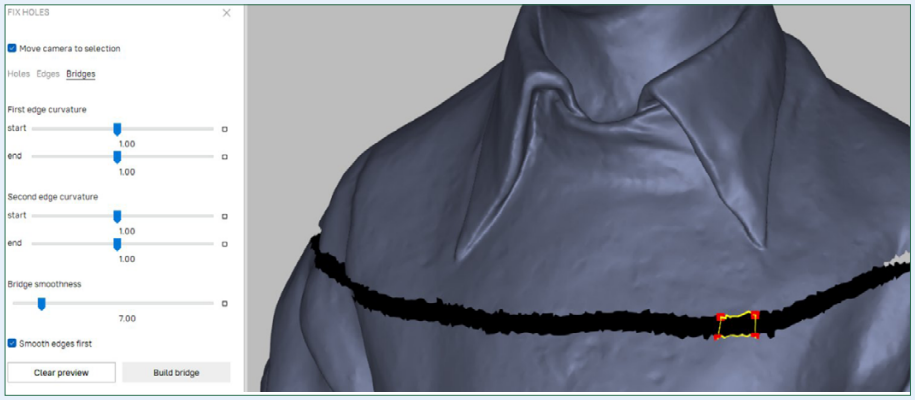


What we have to do now is › **File Export Meshes** (CTRL/Shift-E) and **Merge Models** (see image top right).

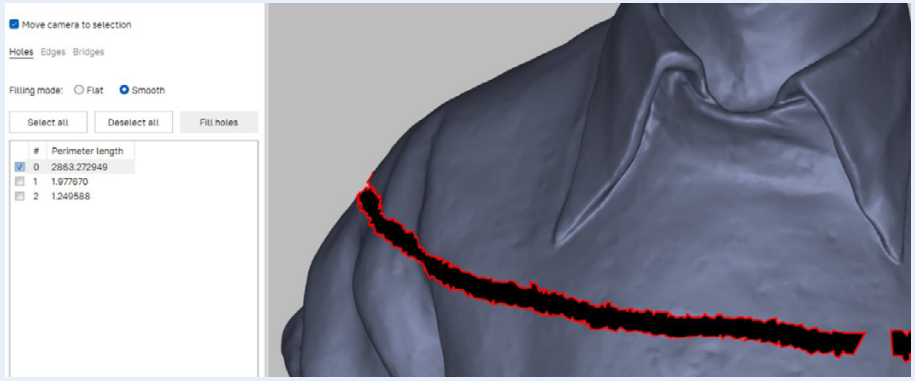
The result is that, when we import this Combination file (here **ScanProject 1**) again, Artec Studio will treat this as one object.

Here we see the three files: the STL of the body, the head and of the "cut off assembly". This has been imported here as one item **ScanProject 1**.

We can now fill this gap. We first do this by connecting the separate parts with a “Bridge”.



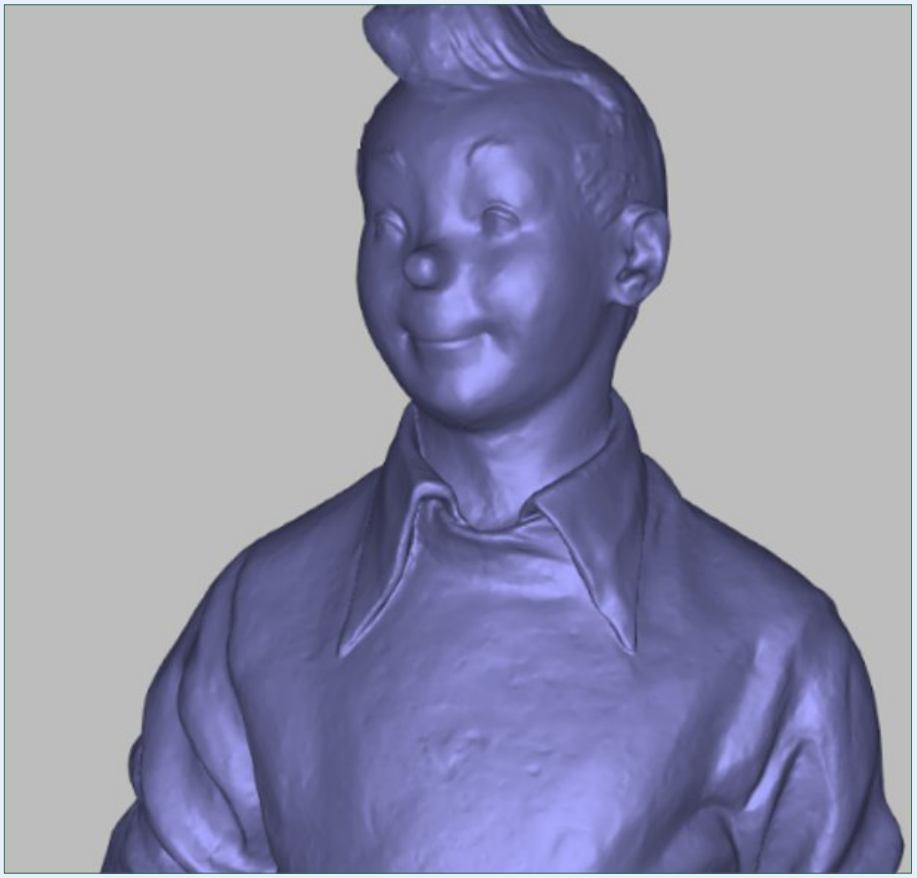
Finally, we can fill in all the gaps.



Note

Check the option Smooth here!

The result is a watertight file of the statue, and we can export that as one STL file!



This way you can merge multiple STL files into one big file **without losing any detail**!

So, we do **not** have to do a Fusion of multiple Fusions!

Conclusion

When we approach a very large project well and logically, we can handle large datasets well in Artec Studio! Again, everything depends on the power of the computer with which everything is calculated!

Dividing a huge project into “manageable pieces” therefore has the following advantages:

- Importing and storing smaller files is much faster.
- Post-processing is faster.
- In the unlikely event that something goes wrong, the entire project is not lost.
- The reliability of the data is greater because you have a better overview.

Have fun scanning with
ARTEC LEO

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