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GROUP 1A

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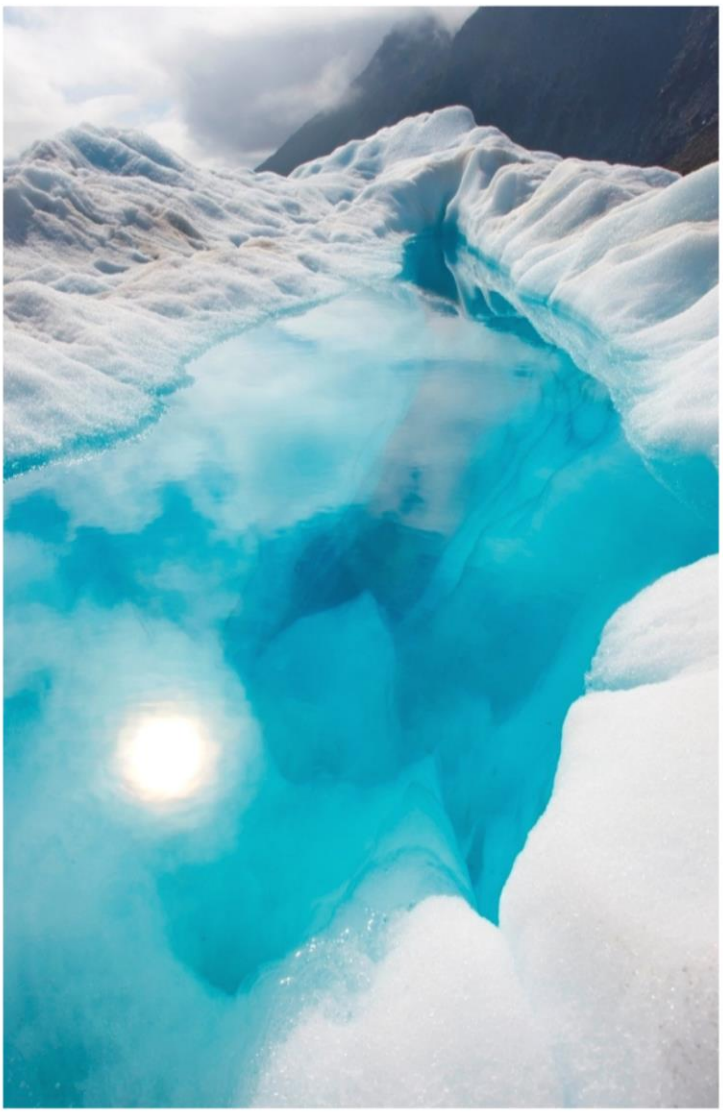
2. RGB – D - Kinect



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Objective

The purpose of this lab is to produce a clean 3D model of an object following the workflow proposed by Artec Studio. A parallel purpose is to recognize how the camera Kinect differs from other professional cameras in other aspects of versatility.

Introduction

The experiment RGB Kinect is mainly focused to 3D scan the environment by using MS Kinect sensor and to observe the scanned images with respect to the given software's. We will use two different software's to get the precise point cloud and mesh analysis of the object. Kinect is a very low cost sensor from Microsoft used for gaming to industrial purposes. The observed results are labelled with different images.

Equipment

For the proper arrangement of the experiments, we will consider:

- MS Kinect RGB-D Sensor
- MS Kinect 12 V Power Supply
- 3D WorkStation from DELL

Software

- Artec Studio from ARTEC Group
- GeoMagic Design X from 3DSYSTEMS

Documentation

- Artec Studio User Guide Manual
- Extract from Beginner's Tutorial for your ASUS 3D Scanner from DASL Wiki

Installation

For the experiment, we are using a Kinect camera to capture the scene. All the equipment's mentioned above are arranged in a proper setup.

- We plug the Kinect
- We initiate the software Artec Studio 9

Procedure

Once the setup is done, we proceed with the acquisition of the images (frames) with the Kinect (our model will be a blue horse figure).

Figure 1. Scanning Setup

We automatically see in screen of the software the reconstruction of the figure. It's important to notice the histogram that appears at the left side of the scanning window that shows which are the ranges of depth in which the frames are being acquired (it is suggested to be in the greener zones)

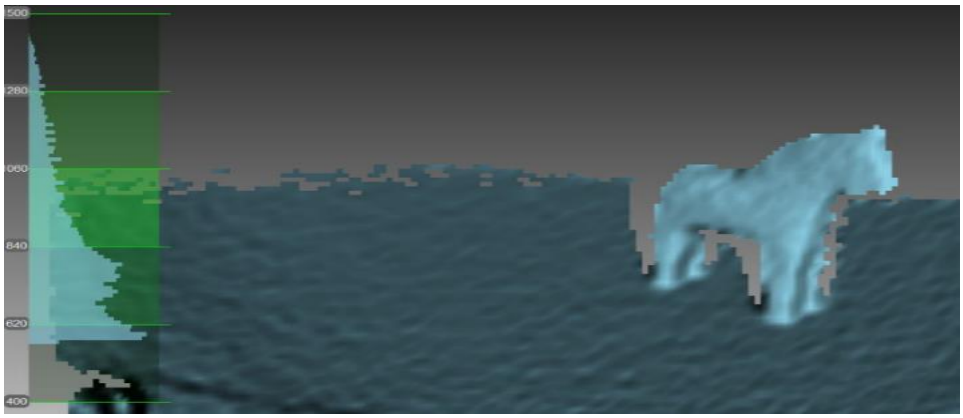

Figure 2. Scanning the object

Also, parts of the image will turn green while the rest will remain gray. Green particles are parts of the image that are being recorded and updated while gray particles are objects that were already recorded.

It is important that we acquire the less amount of data, so the post-processing of it doesn't consume much time.

There are three main tools that we will use in the post-processing of the data:

- Editing tool
- Post-processing tool
- Texture mapping

With the first tool, we erase all the unwanted elements like parts of the table on which the horse figure stands. Doing this part accurately is essential to lead to an effective post-processing, and for doing so the software provides us with different editing tools.

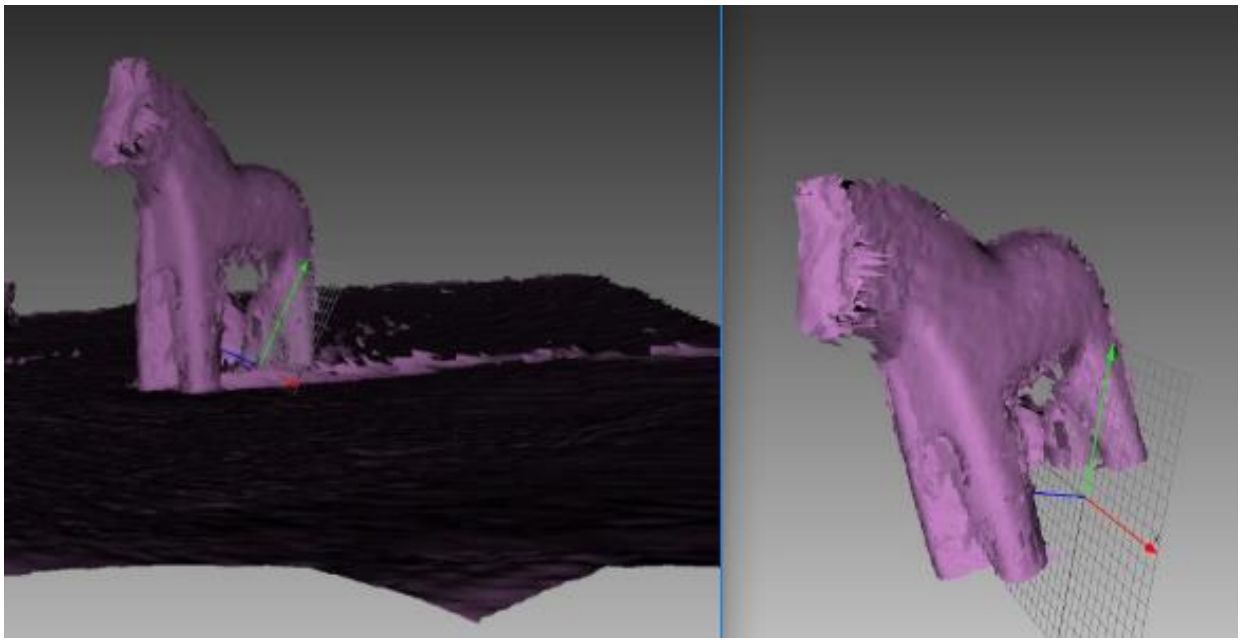

Figure 3. Removal of unwanted area

From the various visualization methods that we have offered to inspect our model (the rendering method), an interesting one is the triangles view, which shows how the different points in the cloud have been attached to their neighbors.

By doing various editing operations we deploy the clean mesh in the labelled figure 4.

It is interesting to notice that, we are acquiring a visualize model of the point cloud by using the Artec studio.

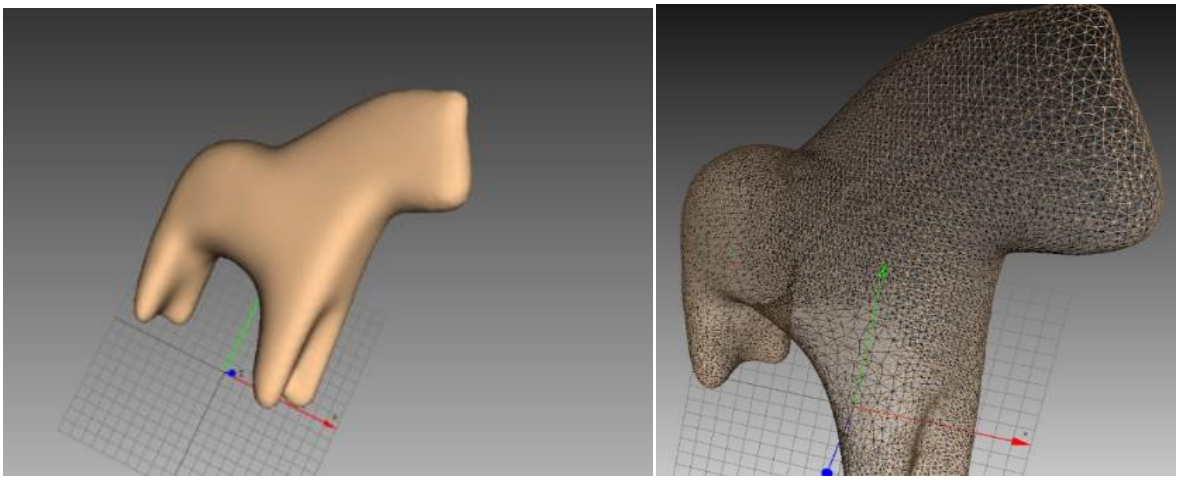

Figure 4. PCL Model

When we apply the texture obtained in the acquisition process, we see that the software automatically recognizes where the texture has to be applied (that is due to the invariance in the axis x, y, z):

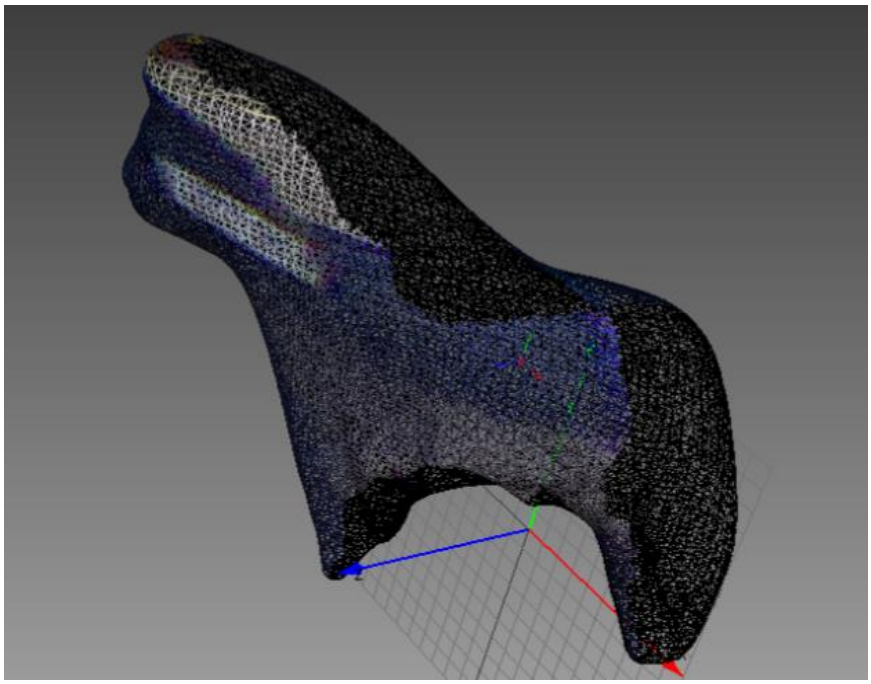

Figure 5. Completed accurate model

We can appreciate that, even if not the complete texture was acquired and applied to the model, it remains watertight. We should remember that filling holes is done by pure interpolation.

Conclusion

We have conducted an experiment in which we applied the low-cost 3D camera Kinect to recollect frames and lead to a reconstruction of a figure. The results are clear:

- We see drawbacks to using Kinect:
    - The time for processing is greater than any “professional” 3D sensor like any Konica Minolta
    - Not as precise as these “high-cost” cameras
- The advantage is simple:
    - Enormously lower price

The last advantage mentioned means everything when it comes to commercial applications that do not require high accuracy, and is because of that that the companies dedicated to 3D inspection are losing a big part of their customers, which obviously prefer a less accuracy but super-affordable device in front of their super-expensive one, even if the accuracy is high.