SPARKLE case

DOORS Digital Incubator for Museums

Who | Institutional Profile

Institution	University of Tartu Natural History Museum and Botanical Garden
Location	Tartu, Estonia
Short Description	University of Tartu Natural History Museum and Botanical Garden were historically separate institutions, going back more than 220 years. In 2014 they were united. The Natural History Museum is the oldest museum in Estonia. There are ca 1.3 million objects in its collections, more than 8,000 of which are on public display. Nowadays, in addition to traditional specimens, the institution also holds DNA samples and runs a biodiversity data management system called PlutoF. PlutoF is used by several institutions for their daily data management and can be also used freely by any researcher worldwide to collect, manage and publish their research data.
Ownership	Public
Size	16,000 visitors to the Natural History Museum and 118,000 visitors to the Botanical Garden in 2021

Approach to Digital	***Input by Veljo Runnel, Martin Vipp*** Digital tools are used extensively in our work - organising collection data, keeping track of loans, sharing collection information with researchers and the general public. Together with other biodiversity collection-holding institutions in Estonia we have developed a biodiversity data management system called PlutoF. Several museums and institutes use it for collection management; we have also taken advantage of its capabilities and widened the scope to citizen science. We use PlutoF-linked applications for recording nature observation and share the collection data to the general public on the web, including images.

What | Case

Project Title	3D Scanning Infrastructure for Nature Education and Remote Research
Timeframe	December 2022 - August 2023

Concept & Approach	Ideas are born from people, and for us the concept was born from interactions between people. We had a co-worker doing his PhD on 3D scanning, and another who organises citizen science events. A third person has programmed educational software. And we had a biodiversity data management system with developers in-house. What a nice combination! So after seeing the DOORS announcement, and reading that it is about the 'digital' we soon had some exciting ideas aligning with our work – using 3D images for real study and work, not just for entertainment, and in a sustainable system of existing software. We already had some

experience in 3D, however it was the challenge connected to stepping up and accomplishing something new that probably gave us the last push to apply.

As a result we blended three cornerstones of our concept into a defined project. First - integrating 3D standards into the PlutoF biodiversity data system. When a 3D scan is connected to a specimen in a collection or to an observed object in nature, it also links a lot of additional information which can be used for further studies:

- specifics of the object: when and where it was found, who identified it etc:
- specifics of object taxonomy - how is it related to other species, what is similar and what is different between them. Such connections get just a couple of clicks apart in the PlutoF system.

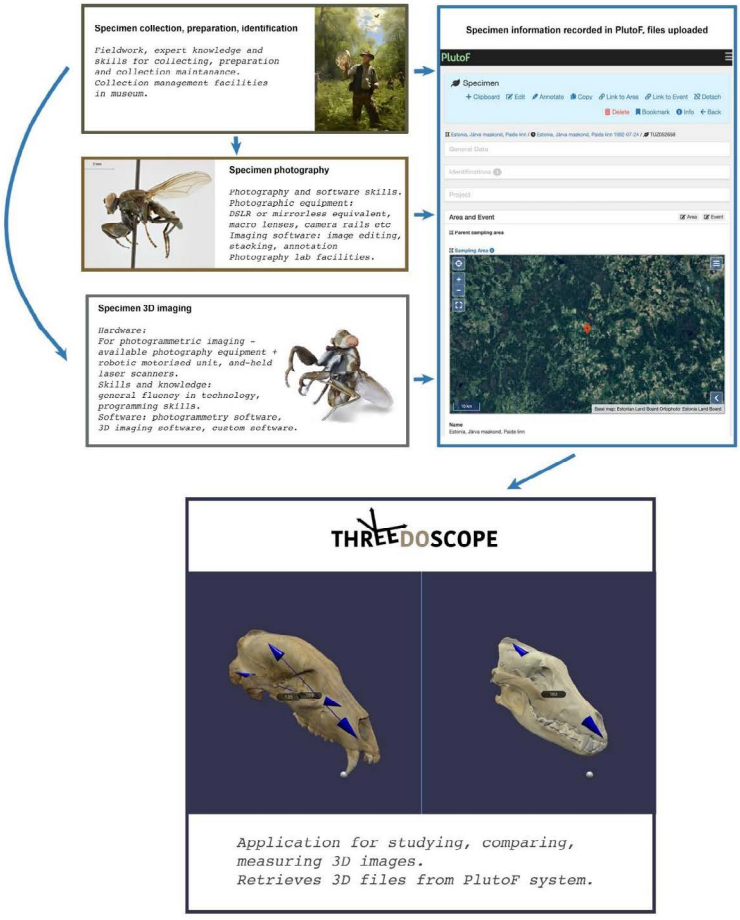
The second cornerstone was building a 3D image study software. 3D files need specific software treatment to make them usable. We figured that simultaneous study of two 3D files in one screen will offer numerous ways to use them in education or research, coupled with measuring and annotation tools. The name of the application is Threedoscope, hinting at 3D images and a visual study feature.

The DOORS project was helpful in building the first version of software and mapping the needs for future developments. In fact, during the DOORS project lifetime we already secured a new update of software in another digital project.

The third cornerstone entailed finding the ways to 3D-scan biological objects, building some standardised methodology and scanning the initial batch of different 3D models for Threedoscope. For the initial batch we chose the skulls from the zoology collection, as they are used in our museum educational programmes. The insects, which have large diversity in size and shape and are also well curated in our collections, were also selected.

By the end of the project we should have a clear, workable 3D-image pathway from objects to a data management system and to practical applications.

3D images, University of Tartu Natural History Museum and Botanical Garden



Threedoscope, University of Tartu Natural History Museum and Botanical Garden

As part of the project we also organised a public workshop mostly directed towards memory institutions (museums and other) which can leverage the usage of 3D in their everyday work.

Public workshop, University of Tartu Natural History Museum and Botanical Garden

Benefits & Impact

The biggest apparent benefit of the project is that we have implemented 3D file handling capabilities into our collection management system. We have also worked through several pathways from scanning the objects to the final file. Overall, we have now gained new experience, which has resulted in several tangible products.

- 3D functionality implementation in PlutoF system comprises the following:
- 3D files can be uploaded to PlutoF system and linked with specimen data; the system will automatically recognise the file type;
- specimen search for the attached 3D files;
- 3D files will have permanent url so they can be used by external applications.

The project resulted in the web application Threedoscope. From the beginning the application was designed to be very simple – to be able to compare visually and measure 3D files provided by the PlutoF system.

Most of the project's beneficial features run in the background. It is like when your phone automatically opens and displays a document file; you take it for granted. From now on, we can take 3D file management in our collections for granted, although this is mostly hidden from plain view and reveals itself only when needed.

What was revealing during the project and workshop in May: with the DOORS project we stepped in the doorway of new exciting opportunities, using realistic 3D images for edutainment or printing 3D images of objects which otherwise cannot be touched by the general public. This is a whole new world which waits to be explored.

Limits & Drawbacks

Time was the most precious resource in this short project and when it was lost, the future started to look ominous. One of the activities in our project was to build an innovative but at the same time experimental automated robotic 3D scanner. This was at the same time exciting and scary. The delays in getting the mechanical parts from China was clearly messing with our timetable. One of the reasons for this is the worldwide crisis in logistics and availability of electronics, caused by the Russian invasion of Ukraine. Nobody could have foreseen this challenge in the autumn of 2022.

Internally it was very tough when several activities collided in our most busy time of the year - May and the beginning of June. It was clear that we had to reschedule some deadlines.

During the project we discovered that 3D expertise and knowledge is very scattered in Estonia. Although some museums have been using the technology, it has largely been undocumented and not handled sustainably. We did not have time to analyse the situation, but one of the reasons is that 3D scanning can be technically challenging for some museums.

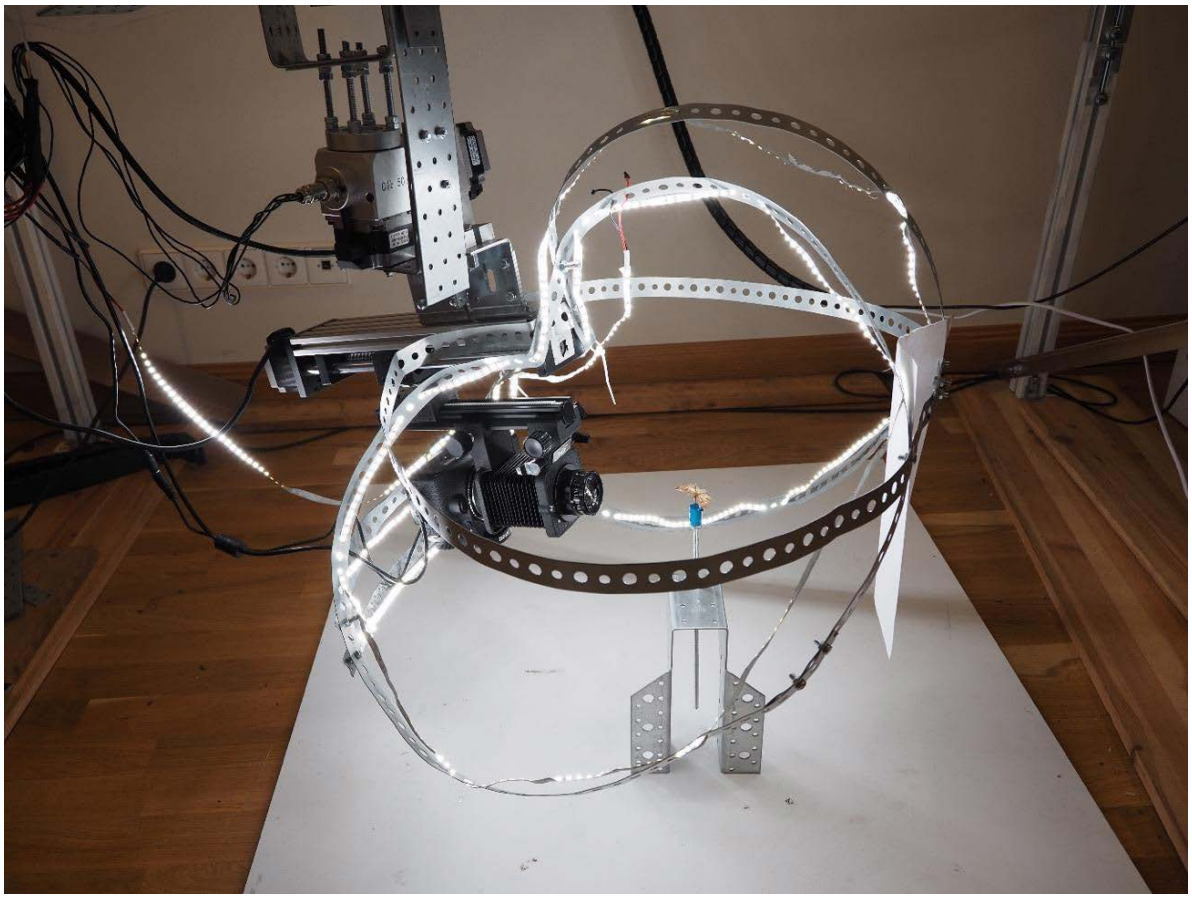
We did not achieve full capacity for scanning of collection specimens at the critical phase of the project because of the delays in scanner assembly. Updating PlutoF and developing Threedoscope was done with a minimal set of scans and we were limited in educational applications.

Future Prospects

Automated, robotic scanning can be a key element in the 3D digitisation of a natural history collection. Developing on your own can be challenging and there are not many people around capable or qualified to do it. Cooperation is important! Also, operating this kind of scanner will probably need continual maintenance capabilities on the part of the institution.

Once the collection has reached a sufficient number of 3D scans (of a certain group of objects - for example, beetles), a digital identification guide can be built based on the scans.

For certain museum objects, realistic printed versions can be highly desirable – as for educational or for commercial uses. Selling replicas of fascinating collection specimens can help museums financially.



Robotic 3D scanner prototype, University of Tartu Natural History Museum and Botanical Garden

Key Take-Aways

- With a novel approach or technology, you must leave enough time for learning and unexpected delays.
- With unfamiliar formats or technology, applications can have pretty simple functionality and still be useful for the end user.
- As long as there is somebody in your team who is still excited about the idea – there is hope!
- With natural history collections you are serving treasures to the general public. Create your application in such a way that the treasures can be appreciated to their best advantage!

Involved Parties

- Toivo Ylinampa (development of a 3D scanning station as part of the PhD work)
- 5D Vision (software company, developing Threedoscope)