



CINE Auto Photogrammetry Service

O.T4.1 A specific solution for the sustainable management of natural and cultural heritage.

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Abstract—The Connected Culture and Natural Heritage in a Northern Environment (CINE), ran from 2017-2020. CINE transformed people’s experiences of heritage sites and material culture, through technology, building on the idea of “museums without walls”. This document describes the CINE Auto Photogrammetry Service (CAPS) a specific solution which forms part of the “Virtual Museum Infrastructure and Toolkit” and contributes to the program sustainable management of natural and cultural heritage output indicators. The CAPS supports the processing of photographs to create 3D models using structure from motion or photogrammetry. (Abstract)

Keywords — virtual reality, photogrammetry, museum at home (key words)

I. INTRODUCTION

The impact of COVID 19 has brought home the importance of engagement with heritage for education, health, entertainment and the economy. Being able to access a museum experience from the home and engage with curated digital content has become a core part of how end users engage with heritage and how heritage organisations provide content. Over the last decade the use of digital phones has opened the possibility of using structure from motion processes to create 3D models of digital artefacts. These digital models can then play a core role in:

- 1) Providing a museum at home experience through digital galleries.
- 2) Contributing to Museum Without Walls experience by being embedded within digital reconstructions
- 3) Enhancing visits to museums, by pvreating interactive content accessible from user devices.

Through developing a Virtual Museums without Walls and a virtual museum infrastructure CINE enables museums to do just that. The idea of a Virtual Museum Infrastructure is the development of a set of resources which enables heritage professionals and volunteers to create resources which provide or contribute to a virtual museum experiences. Central to museums is the ability to engage with artefacts and objects which enable us to explore what life was like in the past.

Creating 3D digital models of heritage objects and specimens, enables multiple copies to be made and for these copies to be transported across the globe so quickly that they are effectively available on a anywhere, anytime basis. Digital copies can be manipulated and investigated without fear of degradation or damage. They can be enhanced without the loss of the original.



Figure 1 St Barbara Statue, Skriduklauster Monastery Gallery

II. STRUCTURE FROM MOTION

Digital photography means multiple photographs of an object can be taken at very little cost. Through taking photographs from multiple orientations software is able to divine the structure of an object from multiple photographs. First creating a points cloud the result is similar to the output of laser scanners, with the result generated from commodity hardware rather than expensive specialist equipment.

Equipment to take the photographs required for photogrammetry, is either already available or available to buy at a small cost. Expensive camera’s may help by a mobile phone camera or old digital camera will do a good job. However, computers with the capability to processing photographs to create accurate models are often not available and are expensive to buy. Whilst commercial photogrammetry

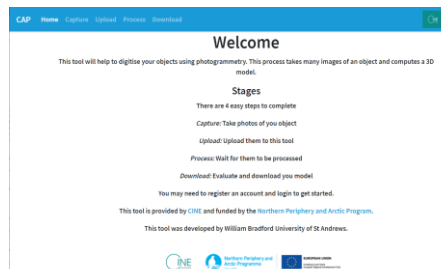


Figure 2 Start up page for CAPS

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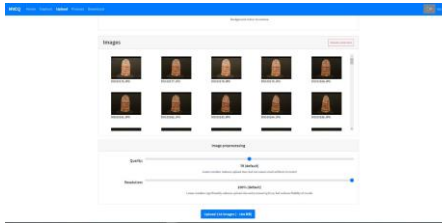


Figure 3 Setting image sizes

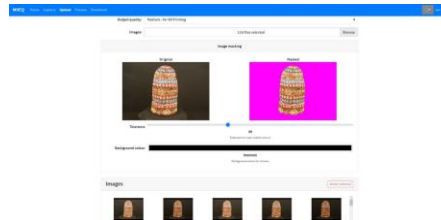


Figure 4 Mask settings

services are available, they often compromise IP and can be costly or offer limited configurability.

Providing a free photogrammetry service, which can access multiple computing resources, breaks this bottleneck and opens the possibility of community digitisation of heritage objects and specimens.

III. AUTO PHOTOGRAMMETRY SERVICE

Digital 3D models of heritage offer possibilities for both the preservation and the promotion of heritage. A 3D model can be explored and manipulated without the danger of degrading the original artefact, multiple copies can be made which can in turn be viewed anywhere in the world. In the past, expensive and specialist equipment was required to make 3D models, but using the photogrammetry process, commonly available commodity computers, phones and cameras can be used. The bottleneck in the system is access to computers with the memory and graphical capability to process high quality models. To address this bottleneck, CINE developed a structure from (motion system??) as a service.

Prior to using the system, users take the required photographs of an object using the photogrammetry (Structure from Motion) method. Users then create an account login on CINEGate, upload a zipped folder of photographs, configure the settings and download the digital model files in return. The idea is to use the CINE Auto Photogrammetry Service (CAP) as part of a structure from motion or photogrammetry workflow.

It has a web-based interface which uses the uploaded images and runs them through MVE (Multi View Environment) and TexRecon to generate a textured mesh and is put into a .zip file. All values chosen in the script were values recommended by MVE. We would check the fidelity of generated models to the actual object, then upload the successful 3D model to the original archive entry, changing it from "unprocessed" to "3D model". If the "Cleared for Release" and "Social Archive" boxes are ticked, the model would automatically upload to the indicated collection on Sketchfab.

CINEGATE contains a related toolkit which supports the Digitisation of Artefacts. The toolkit contains:

- 1) Guides to the structure for motion workflow, which describe each of the steps required.
- 2) Links to instructional videos showing step by step how to select artefacts, choose equipment, set up for the shoot and take the photographs.
- 3) Link to the CAPS system which will automatically process the photographs and return a 3D model.
- 4) There are also example images that can be used to practice photogrammetry on.
- 5) Links to a gallery of 3D artefacts showing how the final output can be used.
- 6) A Trello board with more resources.
- 7) A Wiki link for discussion.

The CAPS system is accessible from the CINEGATE website in the Digitising Artefacts Toolkit. This system allows you to upload your photogrammetry images to be processed and then download the results which could then be uploaded to CINEGATE for use for some other purpose.

To use this system first go to <https://photogrammetry.openvirtualworlds.org/> and then register for a new user unless you have already created one.

There is a guide to taking the photographs to make a model here:

<https://photogrammetry.openvirtualworlds.org/web/capture>.

Once you have your images click on the upload link on the top bar of the website. This will then allow you to name the job select the quality and upload the images.

Once you have selected the images you will get the opportunity to specify what the background colour is and select the tolerance. This will be used to create a mask for the images to remove the background for processing. You want to select a background colour which does not appear in the model.

You also go through your images and remove any from the list that are bad or superfluous before submitting for processing. You can also then select the quality and resolution for the processed image. Once you are satisfied press upload image to add them to the queue.

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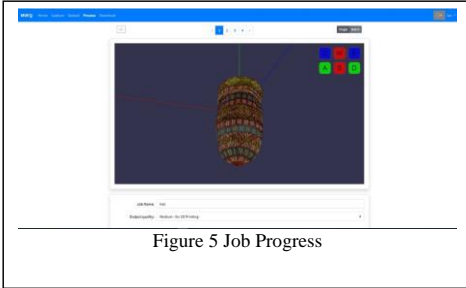


Figure 5 Job Progress

If you click on the Process link at the top you will be able to see the status of your jobs. You can click on a job to see details of its progress. Once it is finished you can press on the Show 3D preview button to see what the results of the process are. If you are happy with this process then you can press accept to make the results downloadable, if you are not happy with the results you can press delete to remove the results.

Behind the scenes this service can make use of multiple computers to process the images, and has large amounts of memory available giving it the capacity to process large data sets. Of course smaller data sets will process more quickly.

We support people who are digitising digital heritage in this way, so please do get in touch and let us know how you are getting on and if you require help.

IV. SUMMARY

REFERENCES

- [1] Example Gallery of 3D digital artefacts from St Catherines Church Donegal and hosted in the CINEG project virtual museum. <https://cineg.org/galleries/orgcontents.php?id=491&collectiontype=Physical%20Object>
- [2] CINE Auto Photogrammetry Service (CAPS) <https://photogrammetry.openvirtualworlds.org/web/home>
- [3] St Barbara Statue from Skriduklauster Monastery <https://cineg.org/type-gallery-page/?itemid=198&type=Physical%20Object>