3D Digitisation

Imaging Services provides a 3D digitisation service, working with a 3D photography rig located in St Pancras. This page provides information on workflows and what you should consider if you're interested in 3D modelling collection items.

The process of 3D imaging is as follows:

1. **Start a new digitisation project**: Follow the same procedure used so far for digitisation projects, including filling in a **Digitisation Project Outline Form**. Specific 3D-related things to look out for in the form:

Section	Description
Section 8: Budget	The Small Digitisation Project Budget Calculator includes a section for 3D imaging. 3D imaging costs to be estimated based on £85 per hour. If needed, please consult with Technical Support Manager Tony Grant on how to estimate this.
Section 10: Digitisation	Please note here whether 3D imaging is required.

2. **Provide information on collection items**: After DIAM approval and scheduling with Imaging Services, some information will be needed on each 3D item. This information is made available on Sketchfab, the online platform where our 3D items are published: **https://sketchfab.com /britishlibrary**
Please provide the following information per item to be 3D modelled:

Field Name	Description	Example
Model name	Name convention: item name + shelfmark	Oracle Bone, Or 7694/1595
Description (max 1024 characters)	Short description of the item, including provenance, date, and links e.g. to the item on the BL catalogue / Digitised Manuscripts, and/or web content such as blogs, articles, project page, etc.	An inscribed oracle bone (jia gu) from the Couling-Chalfant collection at the British Library. Oracle bones were animal bones, usually ox shoulder bones or the underside of turtle shells, used for divination rituals in ancient China. Dating to the Shang dynasty (c. 1600 – 1050 BC), they bear the earliest extant form of Chinese writing and are the oldest items held in the British Library. The inscription on the reverse of this particular bone records a lunar eclipse, which can be precisely dated to the night of 27 December 1192 BC. This model was created for a British Library project on oracle bones that formed part of the UK-China Cultural Exchange 2015, supported by the Department for Culture, Media and Sport. For more information see: http://www.bl.uk/collection-items /chinese-oracle-bone#sthash. 8cDMmsmE.dpuf http://britishlibrary.typepad.co.uk /asian-and-african/

Categories (max two categories)	Animals & pets, Architecture, Art & abstract, Cars & vehicles, Characters & creatures, Cultural heritage & history, Electronics & gadgets, Fashion & style, Food & drink, Furniture & home, Music, Nature & plants, News & politics, people, Places & travel, Science & technology, Sports & fitness, Weapons & military	Cultural heritage & history
Tags	Several keywords to make the model more discoverable	oracle, bone, chinese, shang, dynasty, britishlibrary
License	Select a Creative Commons (CC) license according to how you'd like other to use your models: -*Attribution*. Others can distribute, remix, tweak, and build upon your work as long as they credit you for the original creation. -*Non Commercial*. Others can not use your work commercially. *No derivatives*. Others can redistribute as long as it is passed along unchanged and in whole. -*Share alike*. Others can remix, tweak, and build upon your work as long as they license their new creations under the identical terms.	CC Attribution
Available for download	Yes/No	Yes

3. **Photography and 3D Modelling**: Collection items are photographed by Imaging Services, after which the photographs and above item descriptions are passed on to CyReal. CyReal produces the models and uploads them to Sketchfab.

4. **QA**: Curators are responsible to check that their 3D models were rendered well and that metadata is accurate. Please get in touch with Tony Grant if you have any comments on your 3D models.

5. **Sketchfab platform managment**: Digital Curator Adi Keinan-Schoonbaert is responsible for general management and maintenance of the Sketchfab platorm. This is includes checking model quality, accuracy of metadata, consistency with other BL models, and moderating comments and questions. Feel free to get in touch if you have any questions or comments.

3D Modelling

The British Library's 3D models are available on Sketchfab (**https://sketchfab.com/britishlibrary**) and can be implemented on the Universal Viewer.

As of April 2018, Imaging Services has a 3D photography rig which includes a set of cameras and a turntable. This enables quick and efficient 3D imaging in-house, which is now developed as an internal and external service. The images are sent to CyReal to create the models for us and upload them to Sketchfab. We are now working on devising clear operational workflows for 3D modelling, from Imaging Services, digitisation and preservation perspectives.

If you'd like to start a 3D digitisation project, follow the guidelines on the wiki page for **3D Digitisation**.

The 3D photography rig located at the imaging studio

Resources:

- **CyReal User Guide**: a high-level operating guide to the CyReal 3D photography rig
- **CyReal Recording Capture Records**: an overview of data storage structure and capture records created and managed by CyReal

If staff members are interested in learning how to do 3D themselves, the Library has one educational license of Agisoft PhotoScan Pro, which is installed on the video hot desk (UGF Zone 9). Blender is also installed on the same PC.

You can find here:

- A tutorial for photo capture: Photographic Strategy for 3D Modelling
- A tutorial for PhotoScan version 1.2.3: 3D Modelling of Objects using Agisoft PhotoScan Pro
- A Python script that is needed at the end of the modelling process
- A photogrammetry tutorial with instructions on how to export a model to JSON format (which the Universal Viewer works with): Sophie Dixon Photogrammetry Guide
- Sample images and masks that you can use to play around with the software - use all 3 zip files for this purpose:
    - Sample Images part 1
    - Sample Images part 2
    - Sample Masks

These documents explain the photography process, photo-masking, model creation, and how to upload your models to Sketchfab.

Additional PhotoScan tutorials and manuals can be downloaded from here: http://www.agisoft.com/downloads/user-manuals/

British Library Projects/Examples

Collection Items	Date	Description

Hebrew Manuscripts and Chinese Oracle Bones	2015 /2016	Adi Keinan-Schoonbaert, Digital Curator Hebrew Manuscripts experimented with 3D Modelling of a selection of the Library's Hebrew manuscripts and Chinese oracle bones using Agisoft PhotoScan Pro. These can be viewed and downloaded from here: https://sketchfab.com/britishlibrary View test in Universal Viewer: http://universalviewer.io/examples/?manifest=http%3A%2F%2Ffiles.universalviewer.io%2Fmanifests%2Fadiks%2For_7694_1595.json#?c=0&m=0&s=0&cv=0 (In the drop-down list select the object you would like to see (under British Library) and then click on 'Set' link).
Jane Austen's writing desk, lion wax model, Chinese lacquer box, Qur'an case, ostracon, pen box, terracotta soldier, plasticine Winnie-the-Pooh and Tigger, and a brass block	2018	Tony Grant, Senior Imaging Technician, run a few pilot imaging sessions with different collection items. These were modelled by CyReal.

3D digitisation and preservation resources:

- The Smithsonian 3D Metadata Model: https://dpo.si.edu/blog/smithsonian-3d-metadata-model including an overview, diagram, spreadsheet and visuals.
- MA dissertation by Fiona McKendrick (2019): "Preservation of 3D Assets in the Museum Context: An Investigation and Recommendations"

Collection Profile Framework: 3D Content

British Library Digital Preservation Strategic Priorities, 2017 – 2020:

- Replace and enhance the existing technical repository infrastructure

- Ingest our digital collections into the new infrastructure for long term preservation

- Implement robust processes and reporting mechanisms to provide evidence of preservation

- Ensure content can be accessed by the Library's designated community.

Project Information

Author	Simon Whibley	Created On	2019-02-12

Document History

Date	Version	Author	Change Details
2019-02-12	0.1	Simon Whibley	First draft
2019-03-19	0.2	Simon Whibley	Expanded text
2019-04-01	0.3-0.6	Simon Whibley	Updated following interviews and discussion
2019-06-20	1.0	Simon Whibley, Michael Day	Revised text and further updates

Reference Documents

Date	Document Reference	Distribution
2017	Digital Preservation Strategy 2017 - 2020	Public
September 2018	Cyreal Recording Capture Records - Design Note v0.1	Internal
October 2018	3D Digitisation	Internal
October 2018	3D Modelling	Internal

	Digital Preservation Team	**Project Name:** Collection Profiling	**Date:** 2019-06-20
		Document Title: Collection Profile: 3D Content	**Version:** 1.0

Collection Profile Framework: 3D Content

1. Summary

Content type:	3D Content
Brief description:	The Library provides a 3D digitisation service allowing the creation 3D models from collection content. It also offers a service to external users to create 3D models.
Location:	Interim storage (and external cloud-based storage)
Curator / collection owner:	Adi Keinan-Schoonbaert (Digital Curator, overview) Subject curators (dependent on content type) Imaging Services
Interviews:	Tony Grant (Imaging Technical Manager, April-June 2019) Adi Keinan-Schoonbaert (Digital Curator, April-June 2019) Sandra Tuppen (Heritage Made Digital Portfolio Manager, April-June 2019) Andy Irving (Solutions Architect, June 2019)
Accrual status:	Policy: Active; Accrual method: digitisation Accrual periodicity: on-going, project-basis

2. What is 3D content?

Wikipedia provides the following description of 3D modelling:

"3D modeling is the process of developing a mathematical representation of any surface or object in three dimensions via specialized software."

The technological capability to digitise 3D cultural objects has increased in recent years.

3D content in the context of the Library's current processes refers to 3D models created from digitised images of an object's surface. In terms of this profile, 3D content currently is that created by the Library's Imaging Studio from objects in the Library's collections. It is also been offered as an external commercial service since April 2018. This profile also covers 360 degree panoramas.

3. Acquisitions

As of April 2018, collection items can be photographed by Imaging Services using a 3D photography rig composed of a set of cameras and a turntable. Metadata is created (model name, description, subject categories, tags, and license) and then sent to an external partner, Cyreal for all the model creation work. The original photographs[1] (Canon RAW CR2 files) are converted to TIFF and then exported into OBJ, MTL and JPG files to produce the 3D models. JSON and Agisoft psx project files are associated with each model[2]. The 3D models are then uploaded to the platform Sketchfab, a platform for publishing and viewing 3D, VR and AR content. Currently approximately 30 models have been created ranging in size from smaller models (around 30GB) to globes (about 350GB).

The Library has purchased a dedicated storage server to host the 3D models which can then be accessed via the IIIF-based Universal Viewer (UV). The server will store all the images originally captured, the JSON files associated with each model and the models themselves. The models used in the viewer will be in the GLB format[3] (a binary form of the glTF format (GL Transmission Format), the difference being it includes the textures rather than referencing them as external images). Once this storage solution is in place, Cyreal can begin sending the Library the files[4] they have created, which are currently only stored on their own servers. The 3D models could then be made visible on the UV using a process to generate the IIIF metadata. 3D models in the UV are displayed using neutral lighting[5] (i.e. no shadows) and are rotatable and zoomable but cannot be panned. Examples of models accessible via the Universal Viewer can be seen as part of the Nomad project, a collaborative external project[6]. As the models will not be ingested into the DLS or DAMPS systems in the short term, an interim solution will be required to provide access to the content as they will not have persistent identifiers[7].

In terms of 3D digitisation projects to date, some initial experiments took place in 2015/2016, modelling a selection of the Library's Hebrew manuscripts and Chinese oracle

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[1] Internally, these are only stored locally on a non-networked PC
[2] Described in detail in the Cyreal Data Capture document
[3] This format was suggested by Ed Silverton (from the Universal Viewer Project) as a more suitable choice than glTF
[4] TIFF, the 3D models in both GLB and glTF formats alongside the .JSON files
[5] This is a standard approach for the Universal Viewer. Sketchfab has some of these features e.g. shadows
[6] https://nomad-project.co.uk/archive/index.html#?c=&m=&s=&cv=&manifest=https%3A%2F%2Fnomad-project.co.uk%2Fobjects%2Fcollection%2Fgourd%2Findex.json&xywh=-2655%2C-25%2C8309%2C2223
[7] A similar model has been used to make EAP content available

bones using Agisoft PhotoScan Pro. In 2018, further pilot sessions took place with different collection items using the photography rig.

The Library has also created 360 degree panoramas. These are scanned (400 images are taken) to create a panoramic composed of TIFF images. These are uploaded to create a 360 walkthrough tour using software such as Panotour Pro or web-based services such as 360player. These have mainly been used for external web pages so far (e.g. for blogs) and could be taken of an exhibition space or of a writing room (Hanif Kureshi is a past example[8]). In future, this could be provided as a service for external customers. Currently these are stored locally or via the web-based service. Born Digital Archives have a number of 3D panoramas which were created as part of archival acquisitions. These have never been made available to researchers.

The Library currently holds no born digital 3D content though there may be some content which is part of other collections such as Web Archiving.

The long term plan for this content is that it will be stored in the DAMPS repository, but there is no timeline for this currently.

4. Preservation Intent

It is the Library's intention that:
- Digitised representations of internal collection items should be preserved for as long as it is reasonable to do so and should not be discarded simply because of surrogacy status
- Digitised representations of content from external sources must be preserved in keeping with the acquisition agreement
- Content will be preserved in a manner that supports eventual searching, analysis, and re-use without requiring heroic efforts.
- Derivative copies created for access should only be retained for as long as they are useful

For this class of content, preservation is understood to mean that:
- All intellectual content included in the items as originally acquired shall be preserved.
- Embedded files shall be preserved in a manner fitting to the content type.
- Internal structural relationships between intellectual content shall be preserved
- The appearance of content as delivered to users may vary if not purposefully fixed in the original acquisition
- Additional metadata such as transcriptions are also to be preserved for as long as they are useful. Possibly OCR in the future as well.

5. Issues

- Models are currently only available via Sketchfab
- Need to clarify storage and retrieval solutions for the long-term
- High risk to original RAW images and TIFFs only currently stored locally or externally with partners
- Formats are still developing with no real *de facto* standard established
- No PUIDs for interim storage objects
- Possible a lack of flexibility with the glTF format[9]

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[8] https://www.bl.uk/collection-items/hanif-kureishis-writing-study
[9] https://en.wikipedia.org/wiki/GlTF

6. Collection types

Collection	Acquisition Route	Nature	Type	Format	Role	Status	Action	Owner	Notes	Location
Digitised content	Internal (St Pancras Imaging Services)	Digitised	Image	CR2 (Canon RAW file)	Master	Non NPLD	Preserve	Imaging Services	Photos taken of object only (as of June 2019 approximately 20GB)	Local storage but Interim Storage recently acquired
Cyreal 3D models	External	Digitised	3D Model	OBJ, MTL plus associated files JSON, project Agisoft psx file)	Master	Non NPLD		Imaging Services	3D models created from Digitised content (as of June 2019 there have been 30 models created ranging in size from 30 to 350GB)	Cyreal (External)
3D Models	External	Digitised	3D Model	GLB, GlTF, TIFF, JSON	Master	Non NPLD	Preserve	Imaging Services	- No PUID - No checksumming - Lack of event metadata -Derived from models created by Cyreal	Currently only Cyreal but Interim Storage recently acquired
360 degree Panoramas	Internal (St Pancras Imaging Services)	Digitised	Image	TIFF	Master	Non NPLD		Imaging Services	Collection content or external customer work	Local storage. External via web-based software

BRITISH LIBRARY	**Digital Preservation Team**	**Project Name:** Collection Profiling	**Date:** 2019-06-20
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Key:

Collection name – Content group, define level of granularity
Acquisition Route – How is the content acquired?
Nature – born digital or digitised?
Role – Master? Surrogate? Thumbnail? Access version? Original version?
Type – Image? Document? Media? Spreadsheet?
Format – JP2 / CD Rom etc.

Status – Legal status
Action – Preserve/Process/Destroy
Owner – responsible team /role in BL
Notes – issues specific to this part of the collection
Location – DLS or non-DLS (if not where?)

- end -