



MONTENEGRO

DRIVING THE TRANSITION
TO TOURISM INDUSTRY 4.0
POWERED BY DIGITAL
TECHNOLOGIES

TAKING YOU AND YOUR
INDUSTRY TO THE
NEXT LEVEL



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION



PROJECT AT A GLANCE

Supporting the transition to Tourism Industry 4.0. in Montenegro driven by digital technologies

Donor:

Slovenia

Coordinating Agency: Ministry of Economic Development and Tourism of Montenegro





UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION



PROJECT OBJECTIVE



Strengthen digital skills in Montenegro, through pilot application in tourism, cultural and related economy sectors by introducing technologies and innovation processes to boost competitiveness, production of higher added value products, employment and sustainable economic growth.



Join the Training Programme

on Digital Innovation of Cultural Heritage!

As part of the project “Provision of Digital Technologies Fostering Tourism 4.0 and Technological Learning in Montenegro”, we are pleased to invite you to participate in a **Training Programme** focused on digital storytelling and 3D technologies for cultural heritage and tourism. The programme consists of **five interactive workshops**, combining theory and practice:

- **Introduction to 3D and Digital Storytelling (online)**
10 November 2025, 11:00–12:00 (Registration until 7 November)
- **3D Digital Capture and Data Processing (online)**
17 November 2025, 11:00–12:00
- **Principles of Digital Storytelling with 3D Assets (hybrid)**
27 November 2025, 11:00–12:00 TBC
- **3D Data Management (online)**
1 December 2025, 11:00–12:00
- **Hands-on Workshop (on-site)**
Planned for June 2026

Register HERE

or scan the QR code



Participants will gain both **conceptual understanding and practical experience** with digital tools and workflows that enable innovative storytelling and digital preservation of cultural heritage. We warmly invite **professionals, students, researchers, and cultural heritage practitioners** to join us and enhance their skills in digital innovation for Tourism 4.0.

The project is coordinated by Arctur, a Slovenian high-tech company known for its award-winning initiatives in the field of digital cultural tourism, and is implemented under the mandate of the United Nations Industrial Development Organization (UNIDO) (UNIDO Project SAP ID 230074).

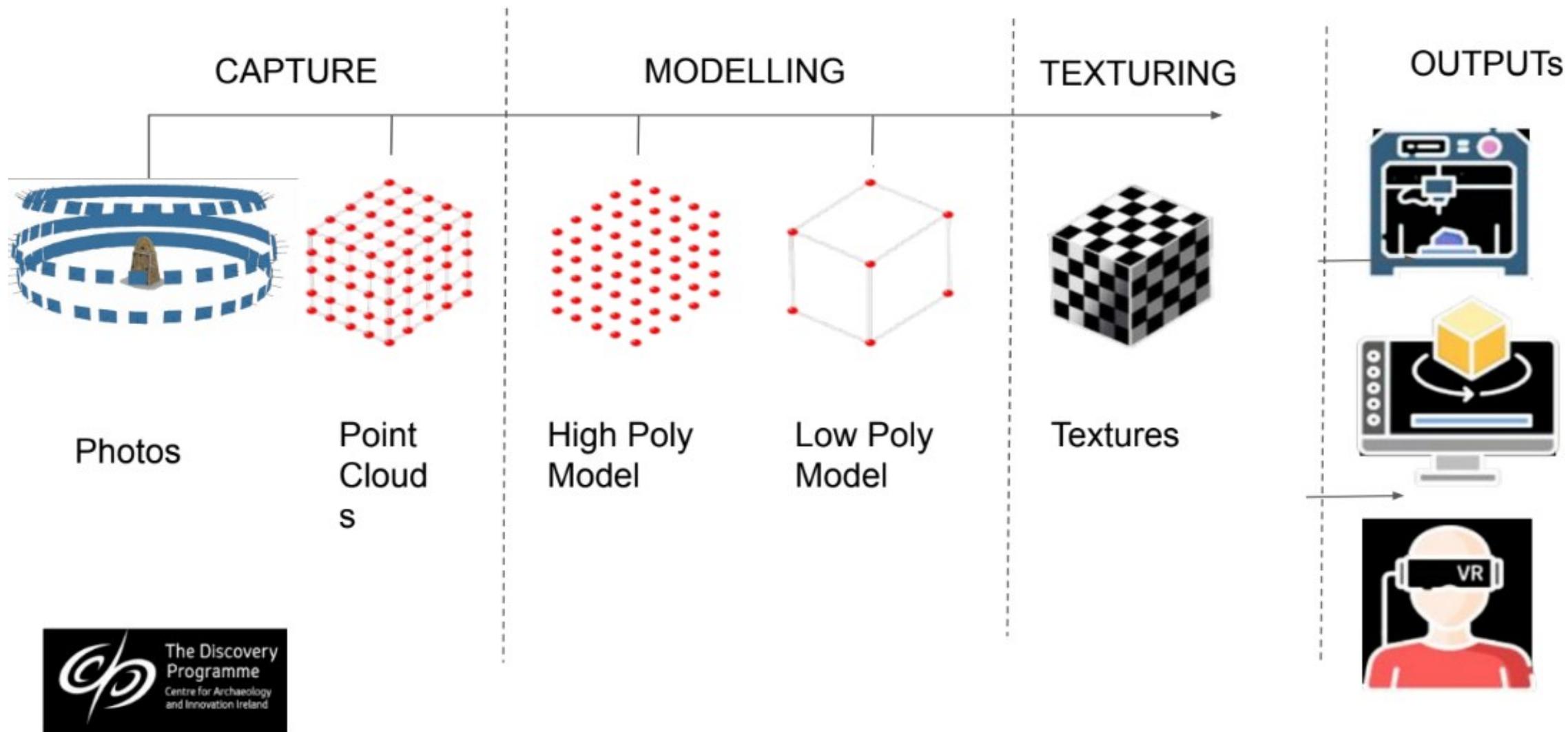
ARCTUR



3D Data Management

Matevž Straus





3D workflow uses various equipment and software

- Survey equipment which produces raw data in various file types
- Software to process the data to produce the desired results which is capable of
 - accepting data in certain file types
 - exporting data in certain file types



LASER SCANNER



PHOTOGRAMMETRY



DRONE



TOPOGRAPHY



GNSS



https://open-science-training-handbook.github.io/Open-Science-Training-Handbook_EN/

What data?

Laser scanning

Thousands of points representing X, Y, Z coordinates, colour and intensity

Multiple scans

Imported into software for registration and processing

Photogrammetry

Thousands of pictures taken at different angles around a CH object

Imported into software which uses a Structure from Motion (SfM) algorithm to produce a point cloud or a mesh

Reference measures

GNSS or GPS ground control points

TPS points on building features and elements

Used for registering laser scan data and photogrammetry

Data formats?

Photogrammetry

Import - images (proprietary raw or standard JPG/TIFF)

Export - point cloud/, meshes and textures

Point clouds

Original raw scan data (proprietary format) + XYZ (ASCII text)

Registered point cloud:

- XYZ (ASCII text)
- E57 (evolving as a standard)
- LAS
- proprietary format

<https://archaeologydataservice.ac.uk/help-guidance/guides-to-good-practice/data-collection-and-fieldwork/laser-scanning-for-archaeology/archiving-laser-scan-data/file-formats-for-archiving-datasets/>

...

Data formats?

Meshes

Open formats:

- OBJ + MTL
- Collada (.dae)
- X3D

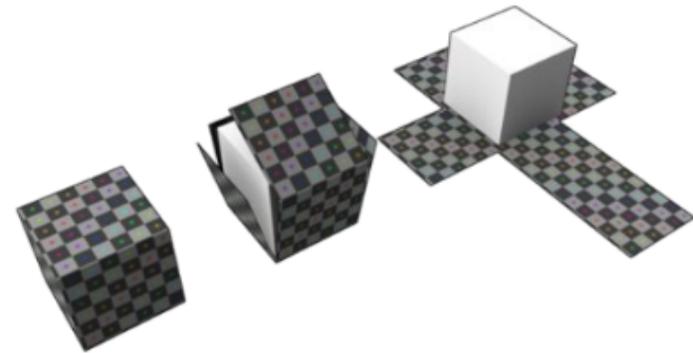
Other formats:

- PLY
- glTF
- STL (for printing)

Textures

Can be saved as:

- JPEG
- PNG
- TIFF
- TARGA (TGA)



What to archive?

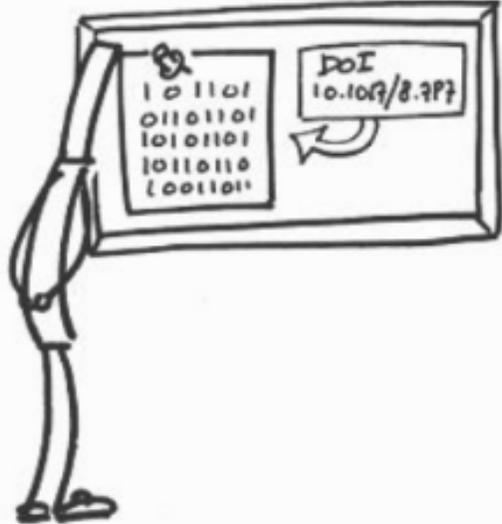
- Lower priority:
 - Derivatives – 3D models for web; for 3D printing etc...

- High priority:
 - Original raw scan data (proprietary & ASCII)
 - Registered point cloud (ASCII + Open format)
 - Original images (photogrammetry)
 - High Poly mesh + textures
 - Low Poly mesh

FAIR DATA PRINCIPLES



FINDABLE



ACCESSIBLE



INTEROPERABLE



REUSABLE

https://open-science-training-handbook.github.io/Open-Science-Training-Handbook_EN/

Metadata?

- Details about the project and how the content was produced
- The technical characteristics – tools and software used, data processing, control, geometry, textures ...
- Info to enable discovery and access – the CH subject, period, copyright, access conditions, media, links ...

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xmlns:dc="http://purl.org/dc/elements/1.1/"
xmlns:dcterms="http://purl.org/dc/terms/"
xmlns:edm="http://www.europeana.eu/schemas/edm/"
xmlns:foaf="http://xmlns.com/foaf/0.1/"
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xmlns:owl="http://www.w3.org/2002/07/owl#"
xmlns:rdaGr2="http://rdvocab.info/ElementsGr2/"
xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
xmlns:skos="http://www.w3.org/2004/02/skos/core#"
xmlns:svcs="http://rdfs.org/sioc/services#"
xmlns:wgs84_pos="http://www.w3.org/2003/01/geo/wgs84_pos#"
xmlns:xalan="http://xml.apache.org/xalan"␣
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  <dc:description xml:lang="en">The Chapel of St Mary of the Snows blends in with the shepherds' architecture and the cultural landscape of the plateau. After many years of effort, it was built in 1938 by local masters from
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  <dc:language>SI</dc:language>
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  <dc:type>Sacral heritage</dc:type>
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  <dcterms:provenance>3D digitised by Arctur d.o.o.</dcterms:provenance>
  <dcterms:isPartOf xml:lang="en">WEAVE</dcterms:isPartOf>
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  <dcterms:temporal rdf:resource="http://www.wikidata.org/entity/Q154611"/>
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  <dc:format>3D</dc:format>
  <dc:rights xml:lang="sl">Zavod za turizem in šport Kamnik</dc:rights>
  <dc:creator xml:lang="sl">Arctur d.o.o.</dc:creator>
  <dcterms:created>2021</dcterms:created>
  <edm:rights rdf:resource="https://creativecommons.org/licenses/by-nc-nd/4.0"/>
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  <dcterms:isPartOf>Kamnik</dcterms:isPartOf>
</core:Aggregation>
```

Metadata capture main information

about a 3D model

Deposit?

- Specify the data for archiving
- Specify formats which have most potential for archiving (open & industry standard)
- Specify the documentation and metadata that is needed
- Agree the copyright status and access permissions

Do not wait until the end.

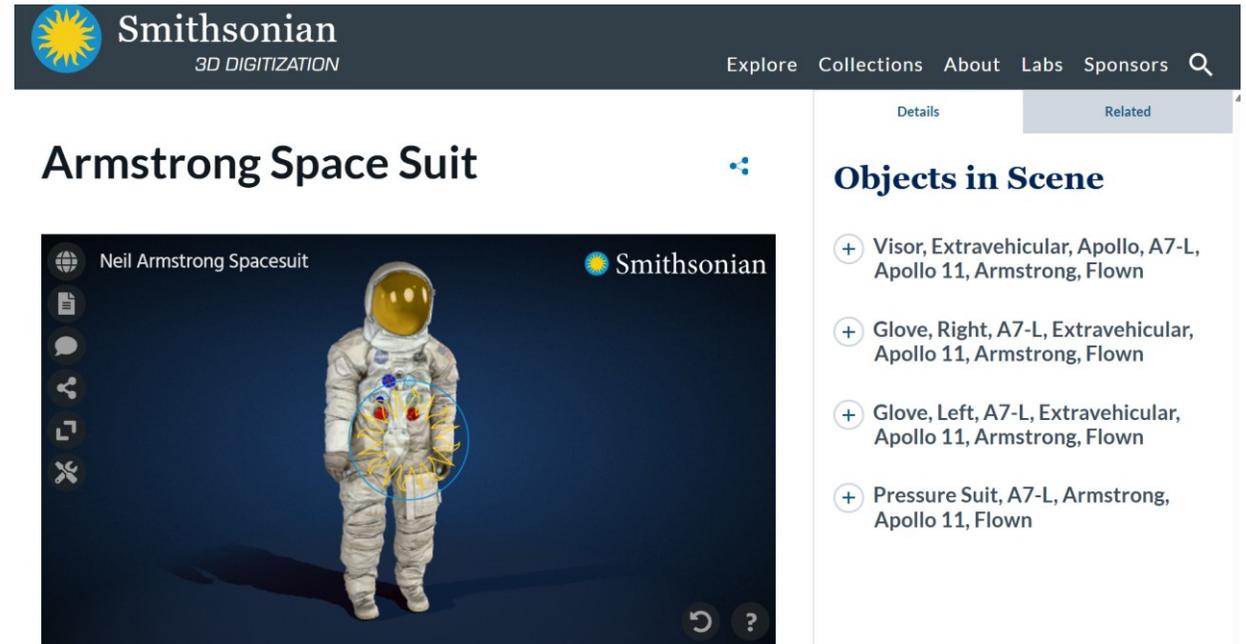
Publishing online?

- From high poly models (HBIM ...) to low poly models (3D printing ...)
- Different hosting platforms answer to different needs



Viewers?

- From open source software on your local server/repository (3D Hop, Smithsonian's 3D viewer...)
- Hosting platforms (commercial or non-commercial)



CATEGORIES



PERIOD



COUNTRY



SARCOPHAGUS COVER

Belgium



CHURCH OF ST MICHAEL

Črna vas



FRIEDRICHSTEIN CASTLE

Kočevje



RAJHENBURG CASTLE

Brestanica



OLD CASTLE

Vuzenica



MONASTERY

Jurklošter



MONUMENT DEDICATED TO ARNOLD RIKLI

Bled



SAINT LUCIA ARCHAEOLOGICAL SITE - ROMAN HOUSE

Most na Soči



English

ARCTUR

Username or email

Password

[Forgot Password](#)

Remember me

LOG IN

What to look for in a web 3D viewer?

01 User friendly

02 Reliable
hosting

03 Supporting
files

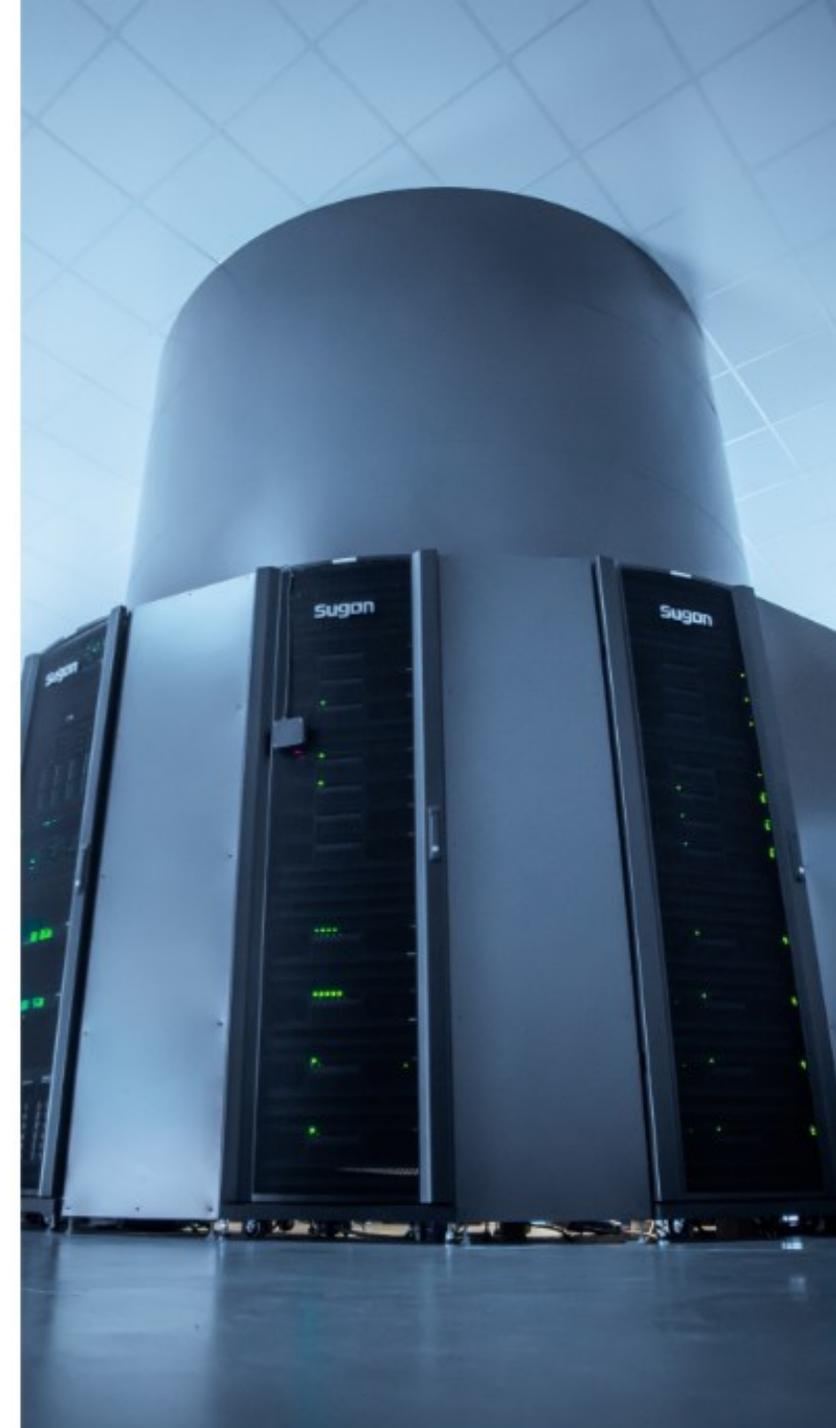
04 Integration with
Europeana

Our initial user requirements

- 01** Ability to safely host large 3D models of cultural heritage
- 02** Ability to view large 3D models of cultural heritage – fast and without special software
- 03** Ability to measure distances, height, surfaces and angles within 3D model
- 04** Easy integration with Europeana

Our first solution in 2022

- 01** Ability to safely host large 3D models of cultural heritage
 - Reliable hosting in Arctur's Data Centre in Slovenia
- 02** Ability to view large 3D models of cultural heritage – fast and without special software
 - Progressive loading of data where the quality improves with time and zooming in
- 03** Ability to measure distances, height, surfaces and angles within 3D model
 - Easy-to-use integrated tools in the viewer
- 04** Easy integration with Europeana
 - Generation of XML (in EDM format)



Supported formats

01 3D

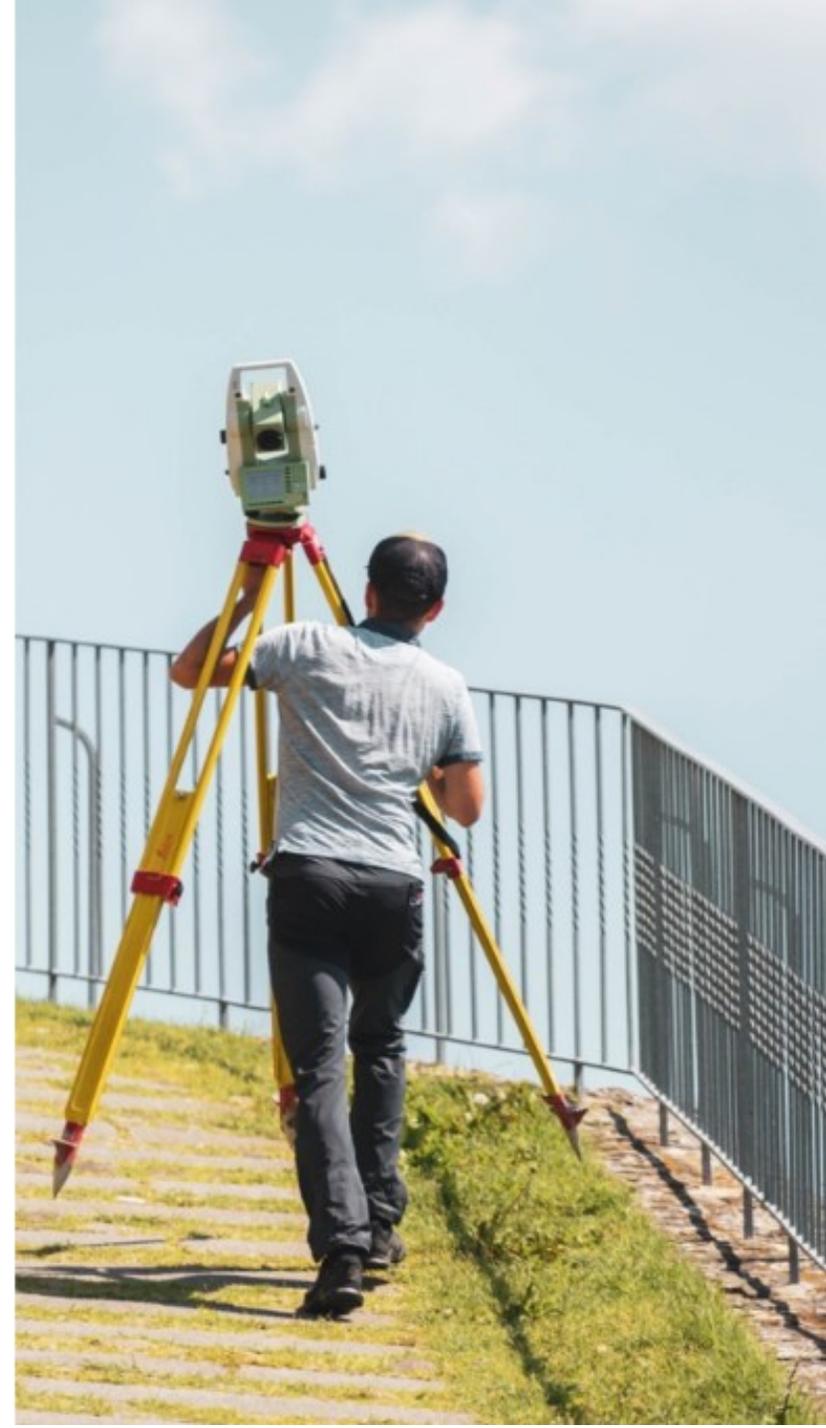
abc, .blend, .dae, .fbx, .obj,
.stl, .glb, .gltf

03 Textures

.jpg, .png

02 Point cloud

.ply



Progressive Loading

Measuring within 3D

Automatic compression

XML Generation

COMMISSION RECOMMENDATION of 10.11.2021 on a **common European data space for cultural heritage**

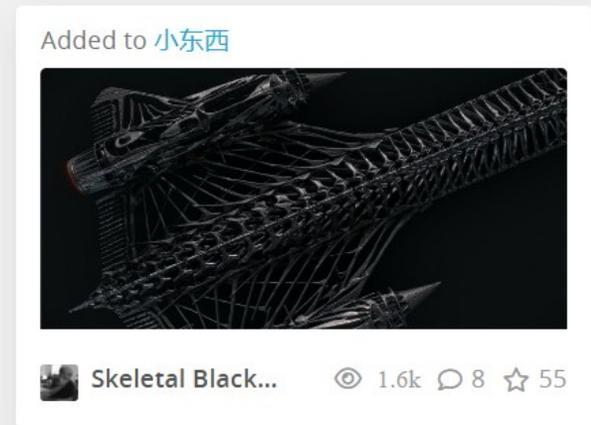
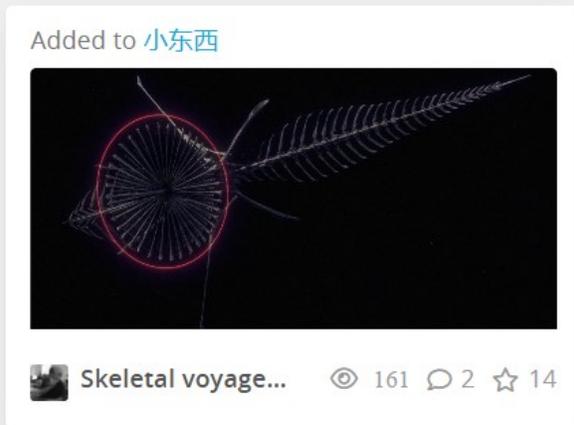
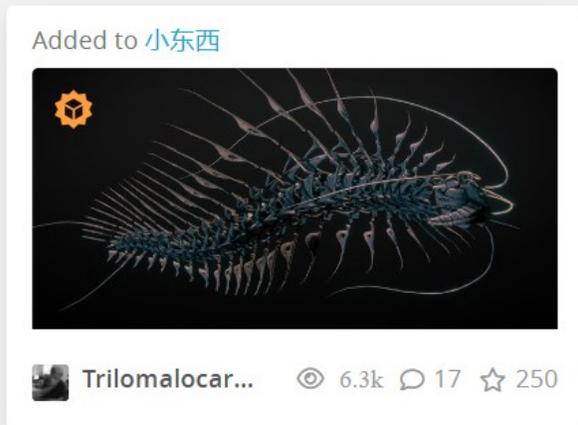
*“...a **comprehensive and forward-looking digital strategy** for cultural heritage at the relevant national or regional level to accelerate the sector’s digital transformation...”*

*“...cultural heritage institutions should take a **holistic approach**...”*

*“...support **partnerships between the cultural heritage sector and other sectors**, such as higher education and vocational education and training, creative industries and sustainable cultural tourism...”*

*“...taking up advanced technologies, such as **3D, artificial intelligence, extended reality, cloud computing, data technologies and blockchain**...”*





Discover Europe's digital cultural heritage

Search, save and share art, books, films and music
from thousands of cultural institutions

🔍 Search 60+ million items



Funded by
the European Union

💬 Feedback



WELCOME TO THE

Common European data space for cultural heritage

Access cultural heritage data from across Europe

BROUGHT TO YOU BY



MERMAID (DANISH: HAVFRUE) IS
A BRONZE SCULPTURE DESIGNED
BY THE DANISH SCULPTOR ANNE
MARIE CARL-NIELSEN,
DEVELOPING A MERMAID.

PLACE: SMK - STATENS
MUSEUM FOR KUNST

LICENSE: PDM

1921

Feedback



KULTURNA DEDIŠČINA ZA PRIHODNJE RODOVE

Slovenija postaja ena od vodilnih držav v Evropi pri vključevanju inovativnih rešitev na področju digitalizacije kulturne dediščine v obogatene turistične izkušnje.

Med letoma 2019 in 2022 je 31 vodilnih turističnih destinacij digitiziralo vsaj tri primere registrirane kulturne dediščine in iz njih razvilo vsaj eno novo turistično doživetje.

S ponosom predstavljamo rezultate!

CERKEV MARIJE SEDEM ŽALOSTI



Modeli

Organizacija ▾ Zvrst ▾ Lokacija ▾ Zbirka ▾



iskalnik išče po nazivu, opisu, EID.



Grad Brežice

Brežice / Gradovi in utrdbe • Arctur

Moderna Zgodovina / 16. stoletje



Ljubljana - Plečnikove Žale

Ljubljana / Sakralna dediščina • Arctur

Moderna Zgodovina / 20. stoletje



Črna vas - Cerkev Sv. Mihaela

Črna vas / Sakralna dediščina • Arctur

Moderna Zgodovina / 20. stoletje



Grad Brežice



Ljubljana - Plečnikove Žale



Črna vas - Cerkev Sv. Mihaela

SHRANI

OBJAVI

PREDOGLED

Poglej XML iFrame

IZBRIŠI

< Nazaj

Nov model

Model

Povleci in spusti datoteke ali [prebrskaj](#)

Ogledna sličica

Povleci in spusti datoteke ali [prebrskaj](#)

Metapodatki o kulturni dediščini

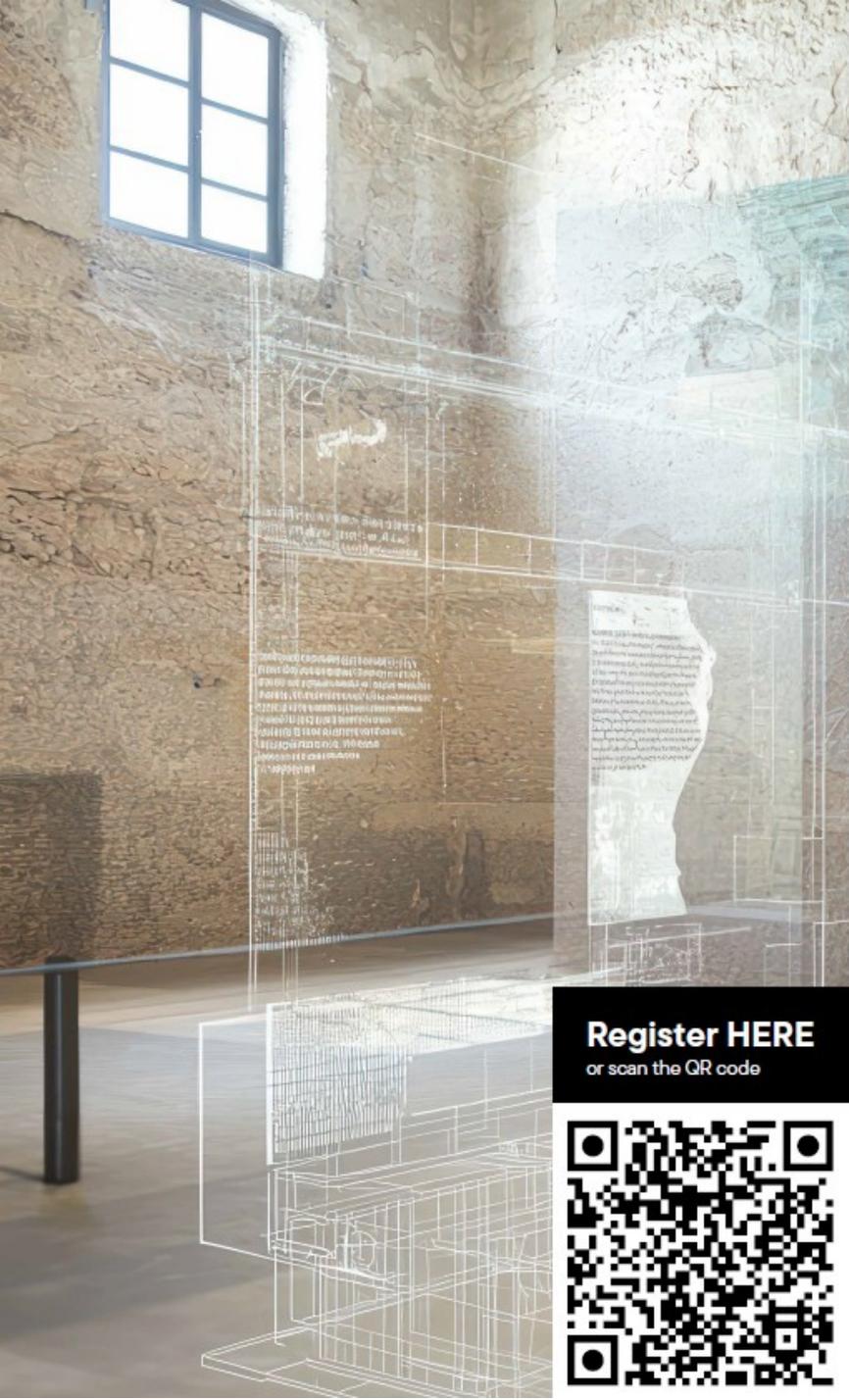
Vrsta dediščine

EID

ID

Naziv*

Opis*



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ARCTUR

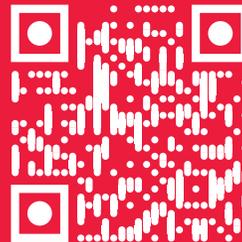


Join us!

Become a member of **Tourism 4.0 Partnership**

Join:

joinus.tourism4-0.org



200+ members

