ADB-LX Corp Joint Workshop 2022

Futureproofing the past:

Spatial data for digital heritage archiving

Hdac
Heritage Digital Archive Center

2022. 10. 01.

Siro Kim

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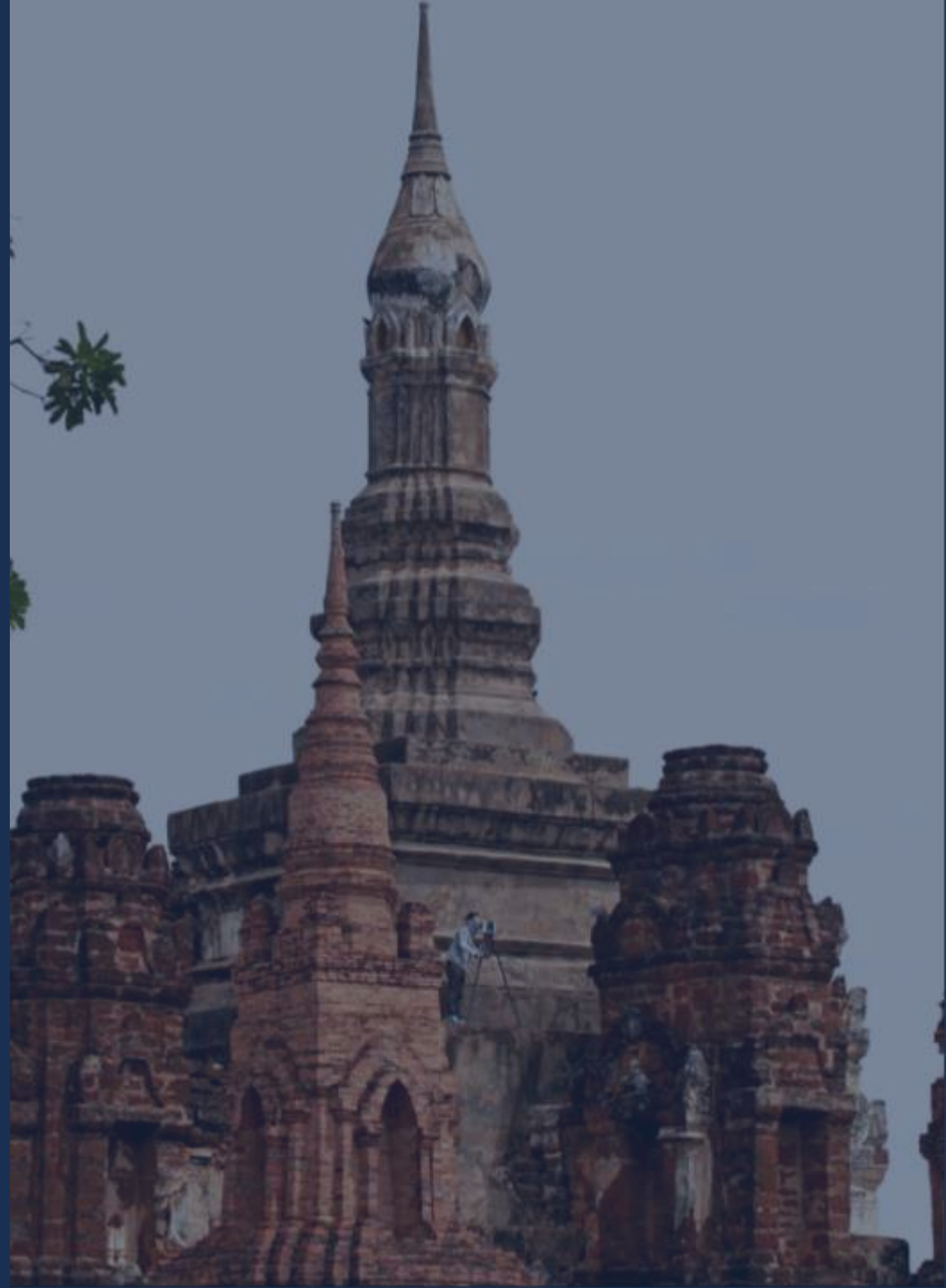


01 Heritage Digital Archive Center

Hdac
Heritage Digital Archive Center

Established: 15th March, 2012

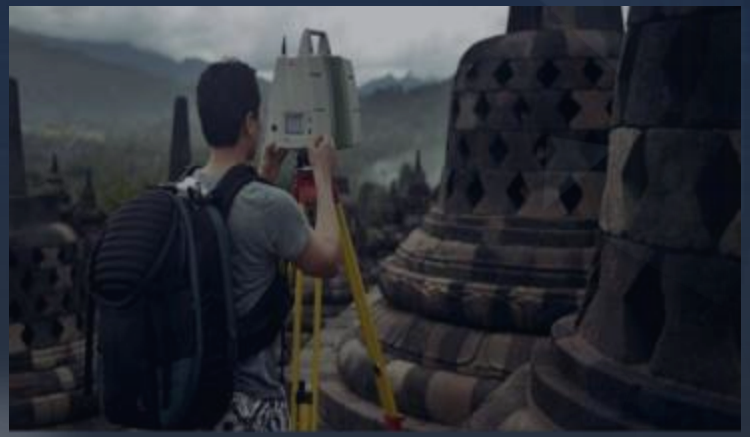
Non-profit recognised by Cultural Heritage Administration

Purpose

“to research, optimise and systematise digital methods for the archiving and preservation of cultural heritage”

Recent Projects

Cultural Heritage Digital Content Archiving Service (2016-2018)
ASEAN UNESCO World Heritage Digital Content Development Project (2017-)
Establishment of Cultural Heritage 3D Database (2018)
Cultural Heritage Digital Content Production Service (2018)
3D Precision Scanning Service: National Museum of Korea Relics (2018)
3D Precision Scanning Service: Gyeongcheonsa Pagoda (2018)



02 Project Brief

ASEAN-KOREA COOPERATION FUND

ASEAN UNESCO World Heritage Digital Content Development Project

Aims

Develop content for VR Room in Busan's ASEAN Culture House
Develop content based upon major UNESCO World Heritage Sites in all 10 ASEAN countries
Strengthen ROK-ASEAN relations by sharing digital archiving methods and technologies
Establish cooperation network for exchange and utilisation of cultural heritage digital archive material

Period

Phase I : July 2017 ~ November 2017
Phase II : June 2019 ~ December 2021

Funding and oversight

ASEAN-ROK Cooperation Fund | ASEAN Secretariat Office

03 Project Scope

- Digital archiving of AMS' major UNESCO World Heritage Sites
- Production of digital content based upon archived data
- Sharing of digital archive data optimized for content development

Where?

10 AMS' Major UNESCO World Heritage Sites

When?

40 month period
2017~2021

Results

Promotional Video

Digital Archiving
- 3D scanning
- Photogrammetry
- 4K and 360 VR Footage

Content Output
- Interactive VR Content
- 360 VR Video
- 4K Video

2017
Cambodia
Myanmar
Indonesia

2018
Singapore

2019 ~ 2021 6 AMS
Viet Nam
Philippines
Laos
Brunei
Thailand
Malaysia

04 Selected World Heritage Sites

Brunei Darussalam
Omar Ali Saifuddien Mosque

Myanmar
Historic City of Bagan

Viet Nam
Complex of Hue Monuments

Cambodia
Angkor Wat

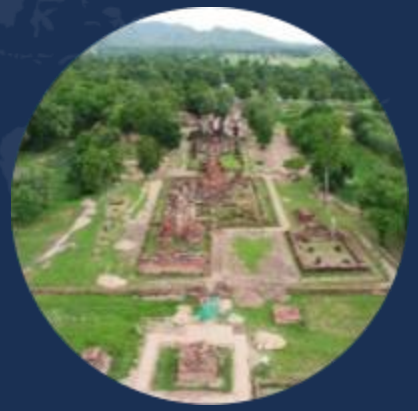
Indonesia
Borodudur Temple Compounds

Consultation with AMS on heritage site selection

Data collection, taking into account specific considerations of each site

Malaysia
Historic City of Melaka

DPR Laos
Vat Phou



Thailand
Sukhothai Historical Park

Philippines
Historic City of Vigan

Singapore
Botanic Gardens

II. Process

01 Project Trajectory

02 Content Development Process

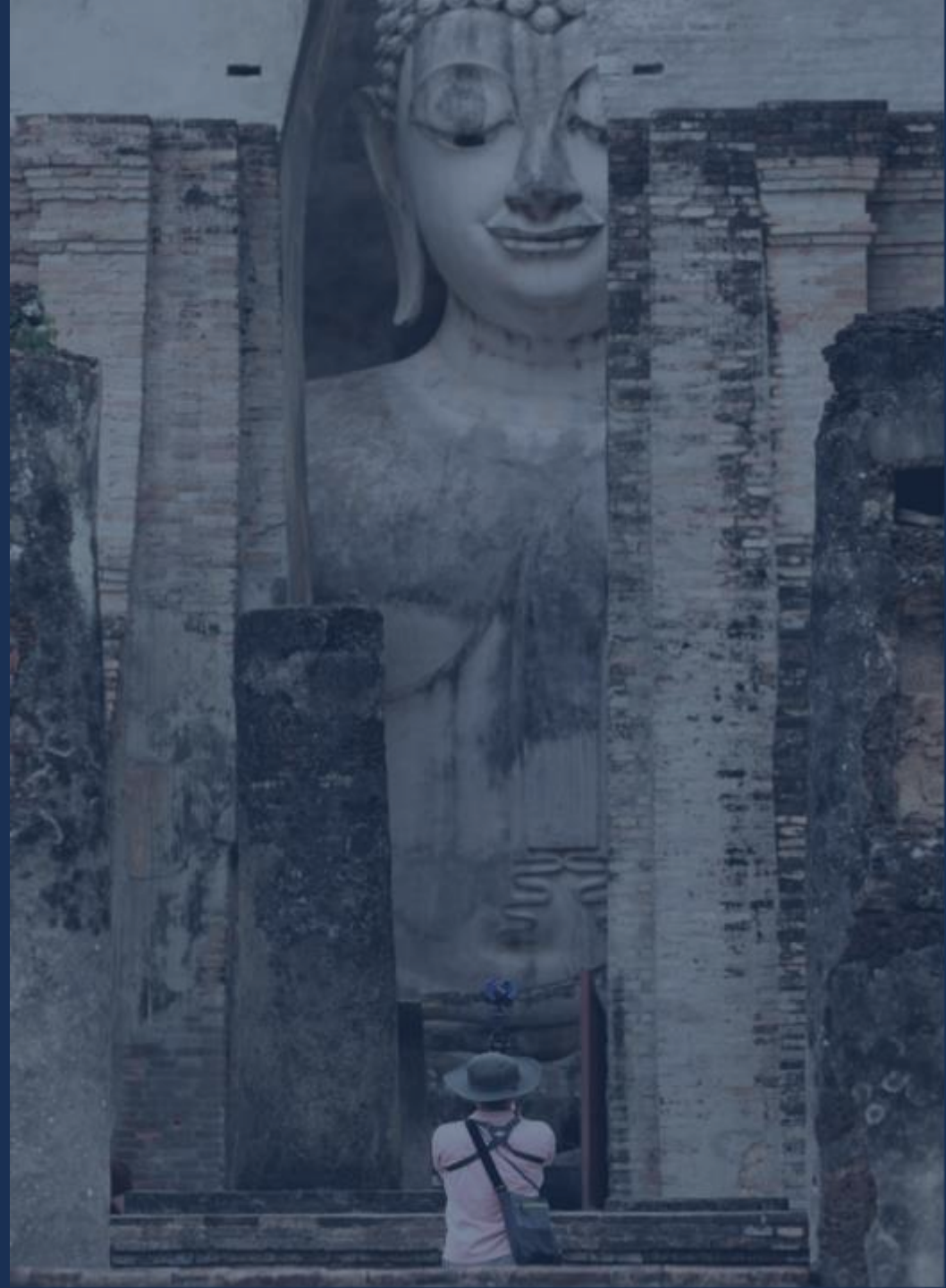
03 Data Collection

04 3D Scan Data: Post-Processing

05 Photogrammetry: Post-Processing

06 3D Model Development Process

07 Content Development Process



01 Project Trajectory

ASEAN UNESCO World Heritage
Digital Content Development Project

Year 1

March 2017 Planning and preliminary preparation for project year one
July 2017 Project contract signed
July-August 2017 Fieldwork in Cambodia, Indonesia and Myanmar
September 2017 Opening of ASEAN Culture House in Busan (attended by Foreign Ministers of 10 AMS)

2017

2018

Year 2

June 2018 Fieldwork in Singapore
July 2018 Korea UNESCO Festival in conjunction with Singapore Botanic Gardens Heritage Festival 2018 - coincided with President Moon's official state visit

Year 3

June 2019 Project contract renewed
July–September 2019 Fieldwork in Thailand, Laos, Viet Nam, Malaysia, Brunei, Philippines
Novermber 2019 ASEAN-ROK Commemorative Summit, First Korea-Mekong Summit

2019~20

Year 4

June 2021 Interrim Project Report
July 2021 Installation of VR equipment in Bangkok's ASEAN Culture Cenre
December 2021 Project Completion Report and presentation of content to respective AMS

2020~21

Establishment of Korea's first database of ASEAN cultural heritage

Year 5

2021. 12

02 Content Development Process

Photo

creating realistic visuals

Scan

enhancing resolution

Aerial drone

DSLR Camera

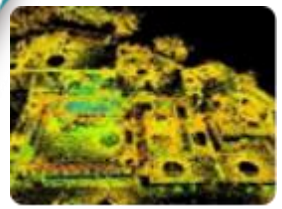
Static 3D scanner

Data collection

Image matching

Polygon generation

Post-processing



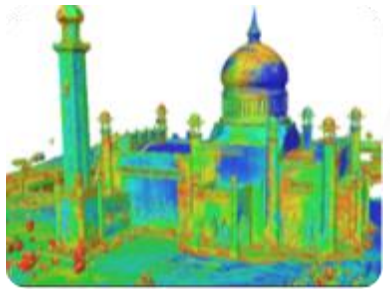
Point cloud generation

Polygon generation

Data modelling

Photo-based modelling

Point cloud-based modelling



3D detail modelling

Finished models

Brunei

Viet Nam

03 Data Collection

From July-October 2019, we captured tens of thousands of photos, thousands of laser scans, and hundreds of hours of video at UNESCO World Heritage Sites in six countries.

Thailand: Sukhothai & Wat Mahathat — July 3-10

	3D Scanning	Photography	Video
Captured	496 Scans	10,627 Photos	> 40 hours
Equipment	RTC	Drone (8291) DSLR (2336)	
Resolution	< 2mm	> 5464 x 3640	

Laos: Vat Phou — July 25-30

	3D Scanning	Photography	Video
Captured	375 Scans	15,820 Photos	> 24 hours
Equipment	RTC (292) Z & F (83)	Drone (8244) DSLR (7576)	
Resolution	< 2mm	> 5464 x 3640	

Viet Nam: Complex of Hué Monuments — August 12-20

	3D Scanning	Photography	Video
Captured	611 Scans	43,913 Photos	> 48 hours
Equipment	RTC (517) Z & F (94)	Drone (4343) DSLR (39,570)	
Resolution	< 2mm	> 5464 x 3640	

Brunei Darussalam: Omar Ali Saifuddien Mosque — September 5-12

	3D Scanning	Photography	Video
Captured	462 Scans	8372 Photos	> 40 hours
Equipment	RTC (385) Z & F (77)	Drone (5075) DSLR (3297)	
Resolution	< 2mm	> 5464 x 3640	

Malaysia: Historic City of Melaka — Sept 30-Oct 6

	3D Scanning	Photography	Video
Captured	221 Scans	5452 Photos	> 40 hours
Equipment	RTC	DSLR	
Resolution	< 2mm	> 6000 x 4000	

The Philippines: Historic City of Vigan — October 14-20

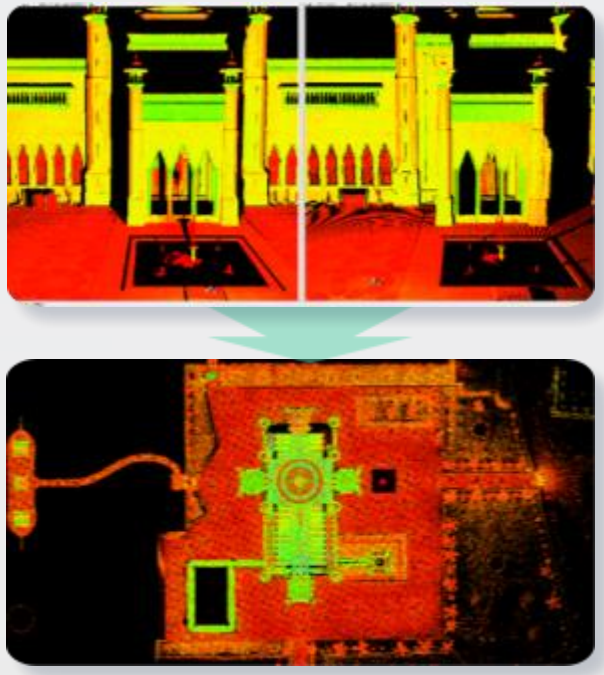
	3D Scanning	Photography	Video
Captured	243 Scans	6386 Photos	> 32 hours
Equipment	RTC	Drone (1478) DSLR (4908)	
Resolution	< 2mm	> 5464 x 3640	

04 3D Scan Data: Post-Processing

Our 3D scan data processing aims to generate the most accurate images possible. This is a three-step process of stitching together point clouds, removing noise from and adding colour and texture to each scene.

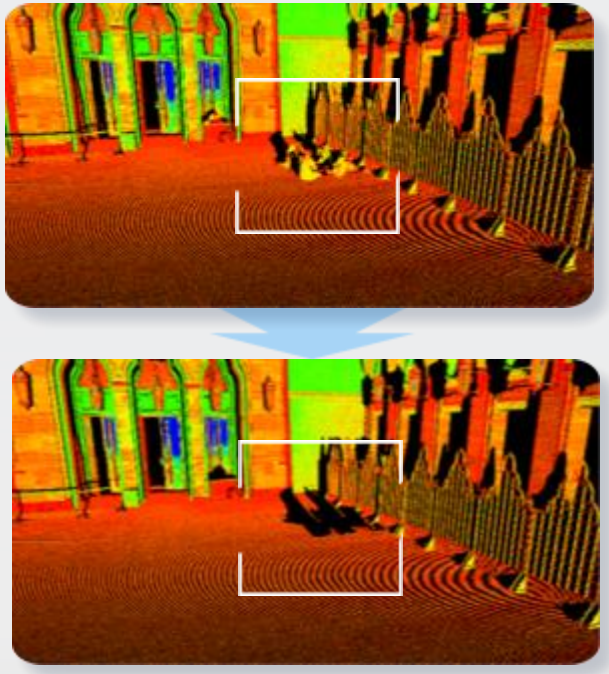
Registration

Two different point clouds are stitched together by identifying three or more matching points in each



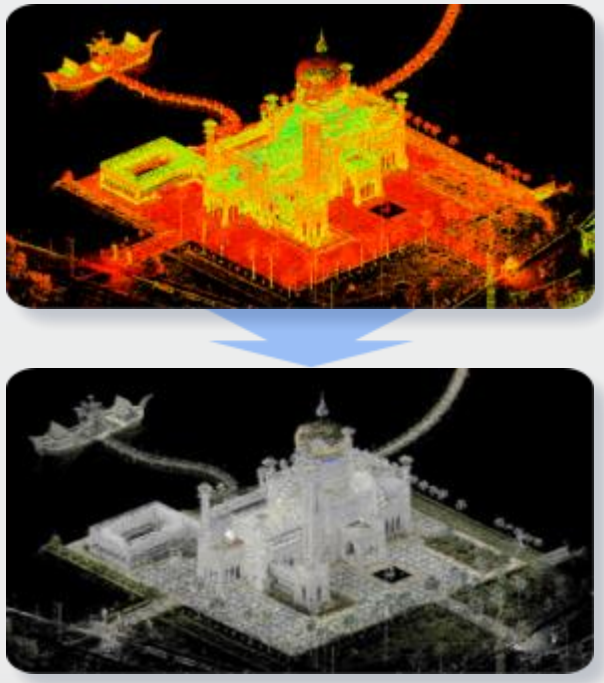
Noise reduction

Removal of extraneous scan data in the frame e.g. people or undesirable objects



Texture mapping

Point cloud data colourised by using photos captured simultaneously with 3D laser scan



05 Photogrammetry: Post-Processing

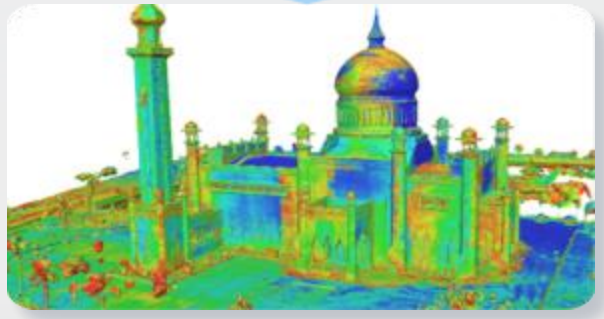
Painstaking care was taken to ensure that the true dimensions and colours of each Heritage Site were faithfully represented in the digital data.

Matching

We use photogrammetry software to stitch together photo data captured on site and establish point groups.

Polygon Data

We use the point groups to generate polygons and then perform noise removal



Texture mapping

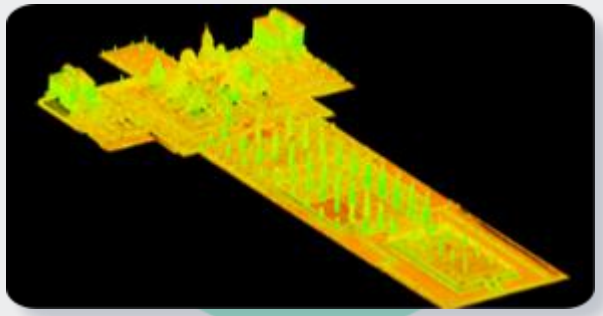
The 3D image is completed by applying textures obtained from photos to the polygon data

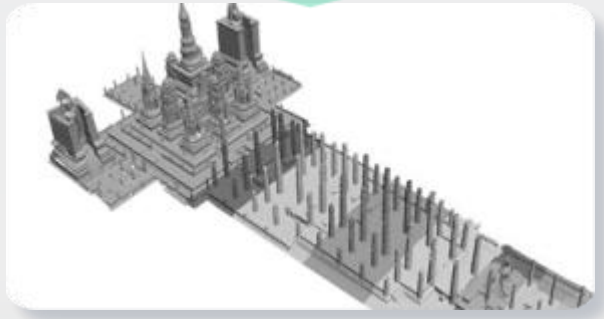
06 3D Model Development Process

Using real-world 3D data from laser scans and photogrammetry, we were able to preciely reconstruct sites with accurate textures, colours, and dimensions

Pre-processing

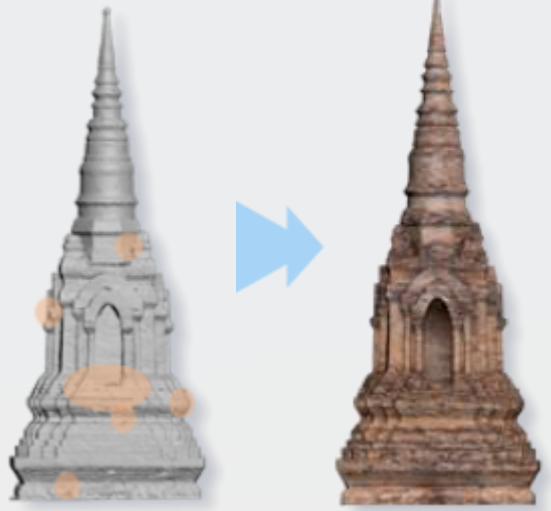
We use photogrammetry software to stitch together photo data captured on site and establish point groups.





Modelling

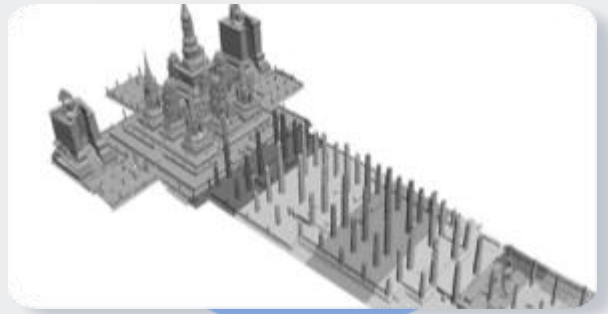
We use the point data to generate polygons, and then perform noise removal



Data are combined and optimised

Texture Mapping

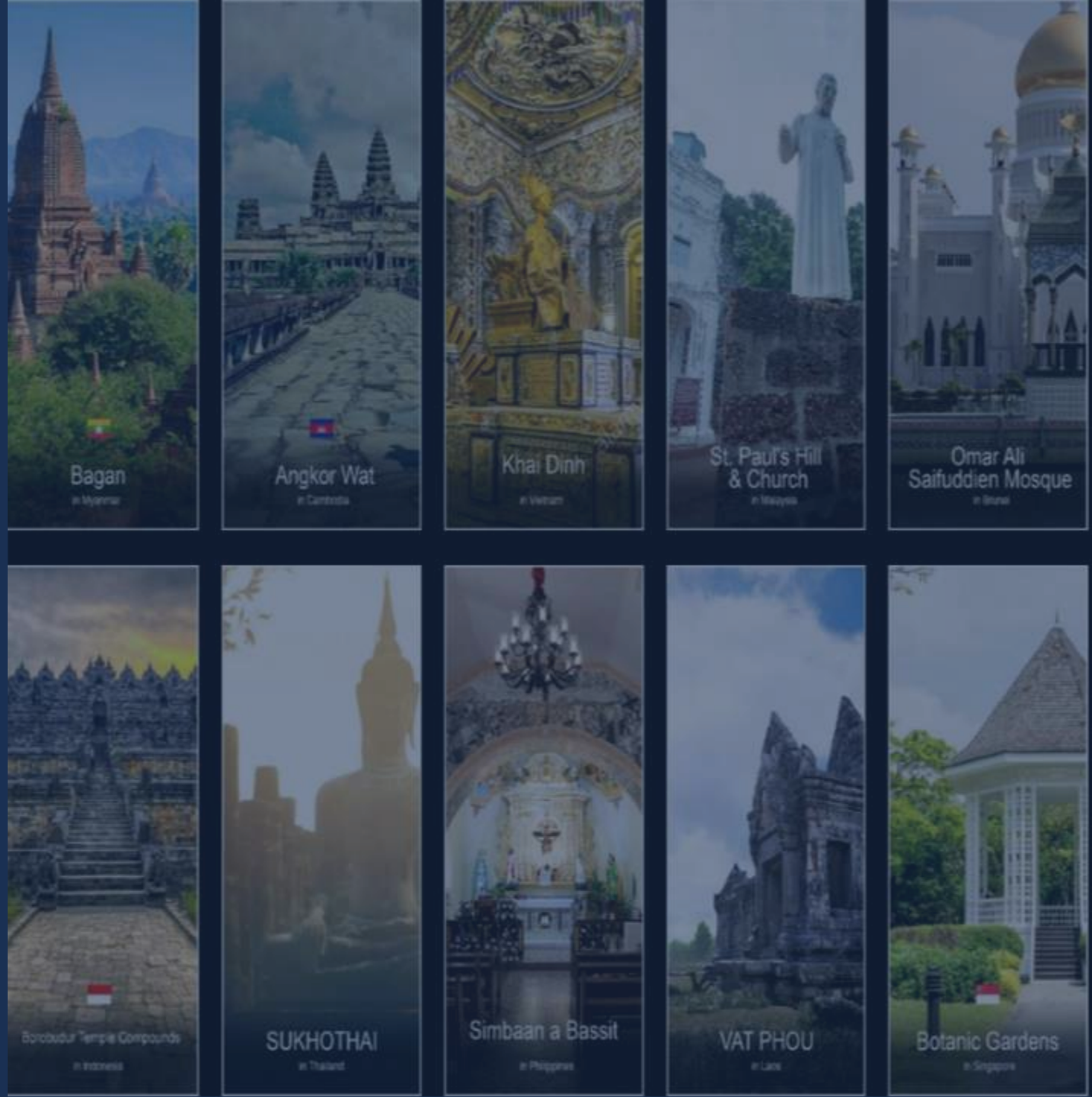
The 3D image is completed by applying textures obtained from photos to the polygon




ASEAN

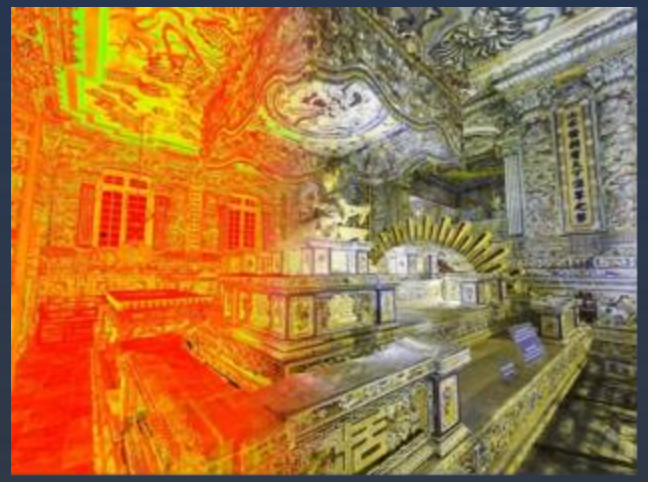
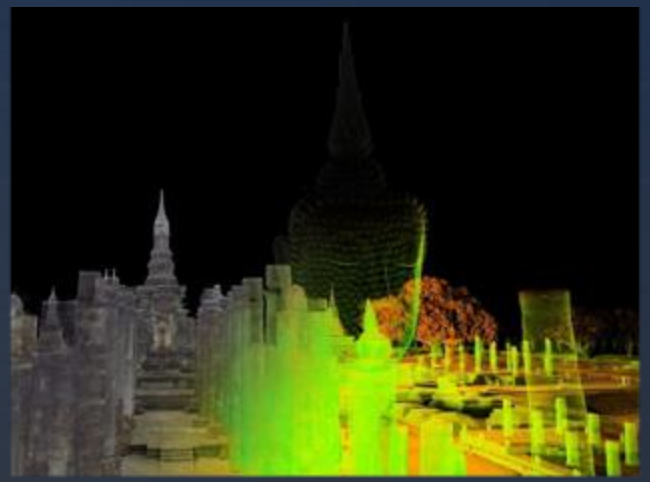
III. Results

01 3D Scan Data
02 Aerial Drone Photography
03 Photogrammetry Data
04 3D Models
05 360 VR Video
06 Interactive VR Content
07 UHD 4K Video
08 'Making of' Video
09 Presentation and Promotion

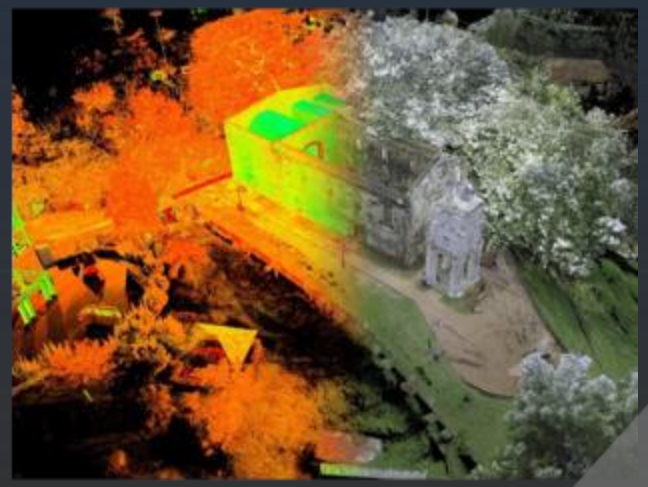


01 3D Scan Data

Under the ASEAN Tourism Strategic Plan (ATSP) 2016-2025.
ASEAN is prioritizing he protection and management of heritage sites

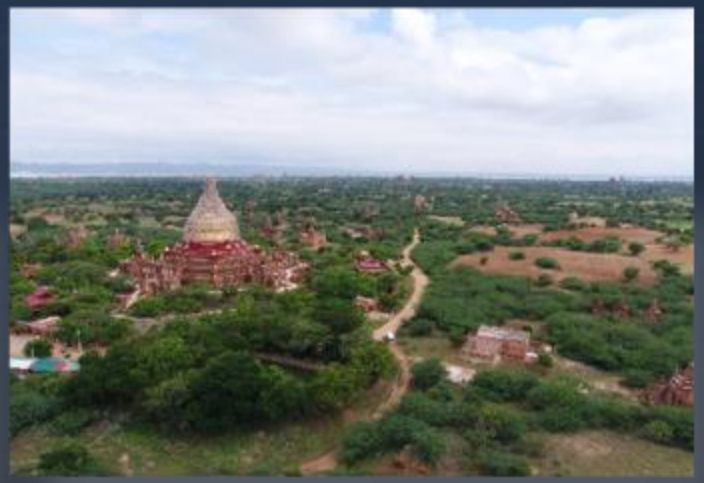







02 Aerial Drone Photography

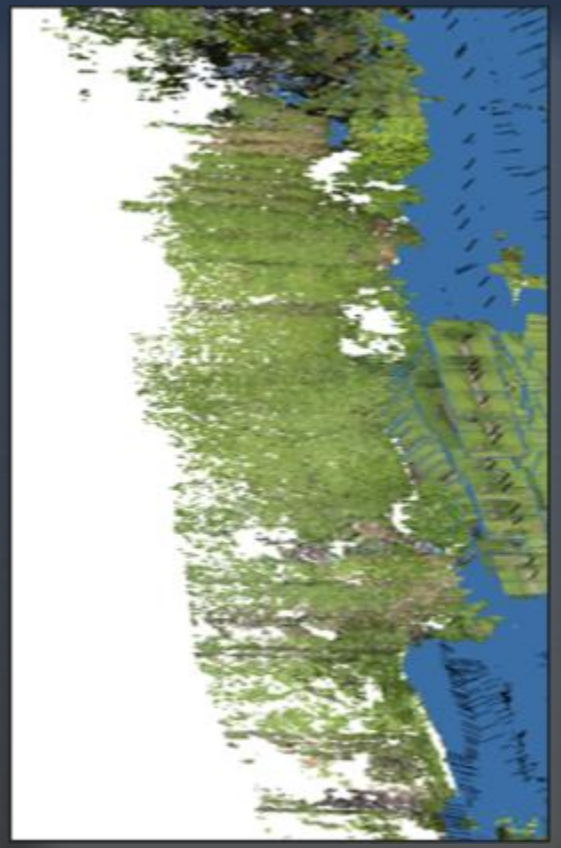
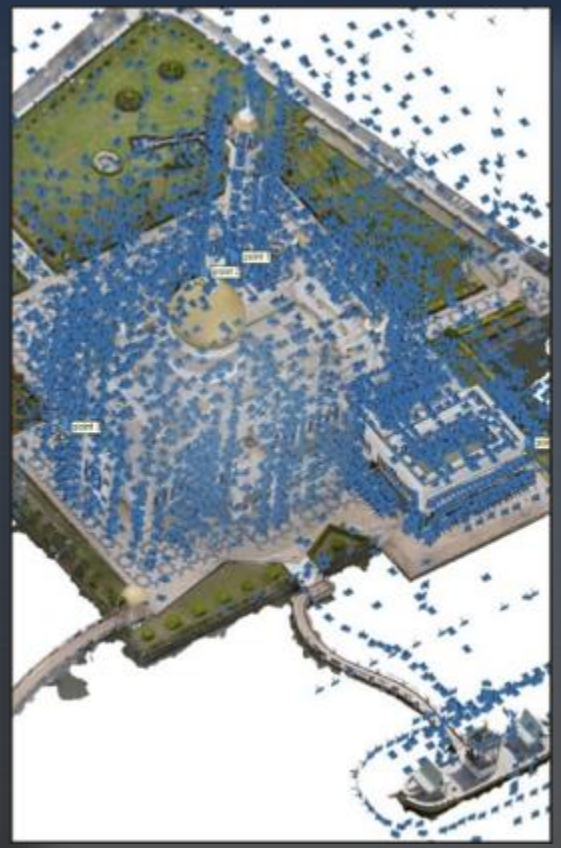
Utilising aerial drones, we were able to quickly capture high resolution footage of vast areas of UNESCO sites, both for our 360° virtual reality content and 2D mapping purposes. Aerial photography was also crucial for filling in 'blind spots' in our scan data.



03 Photogrammetry Data

Surveying techniques enabled us to pinpoint locations in our terrestrial and aerial photography in three dimensions. From there, we were able to combine the data and create point clouds and mesh models of the exterior and interior of each heritage site.


04 3D Models

Incorporating our scan, photographic and floor-plan data of each World Heritage Site, we developed high-quality models that are not mere visual representations, but contain real-world topographical and spatial data.

05 360 VR Video

06 Interactive VR Content

06 Interactive VR Content

06 Interactive VR Content

07 UHD 4K Video

08 'Making of' Video


Palawan
ISLANDS
Koror
Kudat
Davao
Kota Bahru
PALAU
Borneo
Singapore
Sangkulirang
Menado
Halmahera
Palu
Sulawesi
(Celebes)
KEPULAUAN SULA
Sorong
Kolonodale
Kendari
Ambon
Kolaka
GREATER SUNDA ISLANDS
Makassar
Jakarta
Semarang
Madura
Surabaya
Sumbawa
Yogyakarta
Banyuwangi
Mataram
Labuhanbajo

09 Presentation and Promotion

09 Presentation and Promotion

IV. Forging Ahead

Where Next?


The 1st Mekong-Republic of KOREA Summit
Nov. 27, 2019 Busan, Korea
TF.CO.KR
THE FACT

Thank you

감사합니다

ASEAN-KOREA COOPERATION FUND

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