IREAL 3D

FORWARD 2022

Case Studies on 3D Digitization of Cultural Relics

Scantech • A World-leading Brand of 3D Digitization

01 About Scantech-Company Intro

Scantech is one of the earliest high-tech companies starting to research and develop handheld 3D visual measurement devices across the world.

Scantech products are sold to more than 60 countries and regions, serving over 5000 enterprises. The presence of our distributors and international sales and technical support teams has been expanded all across the globe, providing industrial frontier 3D measurement solutions for prominent enterprises and research institutions like COMAC, BMW, Volkswagen, GM, Apple, Siemens, JCB and Sany.

Scantech has been gaining rapid growth ever since its establishment due to our continuous input in R&D and management, as well as the attraction of top-notched talents. The talent pool enables us to develop a series of proprietary 3D digital measurement systems.

Scantech · 3D Digitizing Everything

02 Products-Portable 3D Scanners

HD color texture

IREAL

Multi-purpose, fine details

KSCAN

Non-marker scan, high accuracy

TRACKSCAN

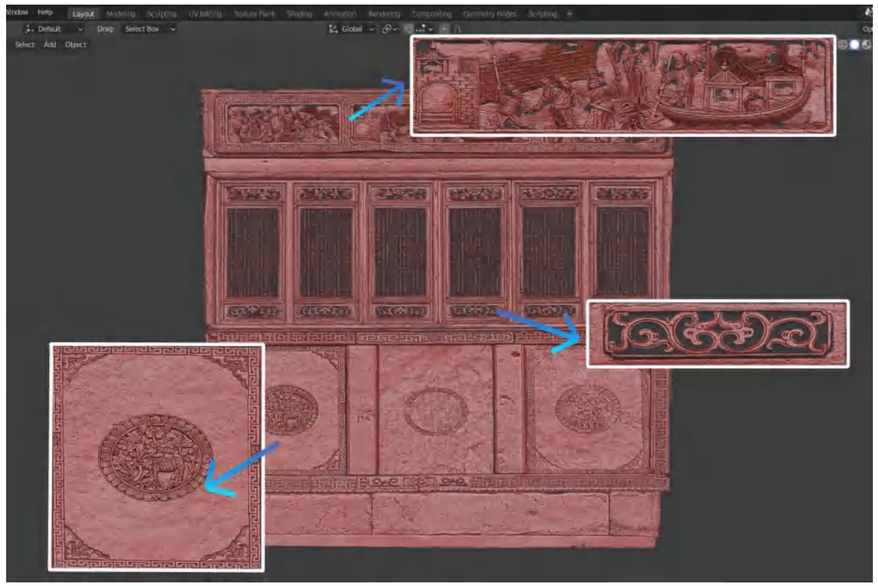
02 Products-Handheld Color 3D Scanner

3D scanner: iReal 2E; **Highest accuracy:** 0.1 mm; **Highest resolution:** 0.2 mm

Technical advantages: It can obtain color texture directly, and can directly 3D scan items with rich geometric features/texture features without sticking markers. Easy to use and fast to get started with.

Applications: 3D scanning medium and large-sized carved artwork and objects with matte surfaces (the recommended scanning size should be larger than 50 cm, suitable when the requirements on color restoration and accuracy are relatively low.

02 Products-Handheld 3D Laser Scanners



TrackScan-P42: Ancient Building Carvings Dinosaur Fossil Site Excavation

3D scanners: KSCAN-Magic, TrackScan 3D scanner series

Highest accuracy: 0.02 mm/m; **Highest resolution of ultra-fine blue light:** 0.01 mm

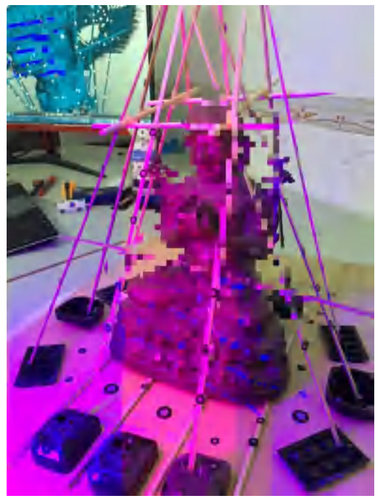
Technical advantages: Strong material adaptability (no need to spray powder for reflective/dark objects), ability to obtain complete 3D data of deep holes and dead corners, fine details (even for the patterns on the coins), no limitations on the size of the scanned object, and high accuracy.

Notes: When using KSCAN-Magic, you need to stick markers on the scanning auxiliary to obtain 3D data of the scanned object. If the scanned object cannot be stick with markers and the scanning auxiliary cannot help, it is more suitable to scan relics within 50 cm (if the size is too large, markers need to be placed on the scanned object). The price of KSCAN-Magic is moderate.

TrackScan can realize non-marker scanning, especially for medium and large-sized cultural relics, however, its price is relatively expensive.

02

KSCAN-Magic - Auxiliary Tools for Sticking Markers



Note: With clever use of auxiliary tools and magnetic markers, you can scan without sticking markers on the scanned items.

03 Overview-3D Digitization of Cultural Relics

Using the 3D digital modeling technology of cultural relics, accurately obtain the 3D information of their texture and size, establish 3D models of precious cultural relics, and effectively carry out digital protection for them. 3D digitization can provide important data support for the digital protection of precious cultural relics.

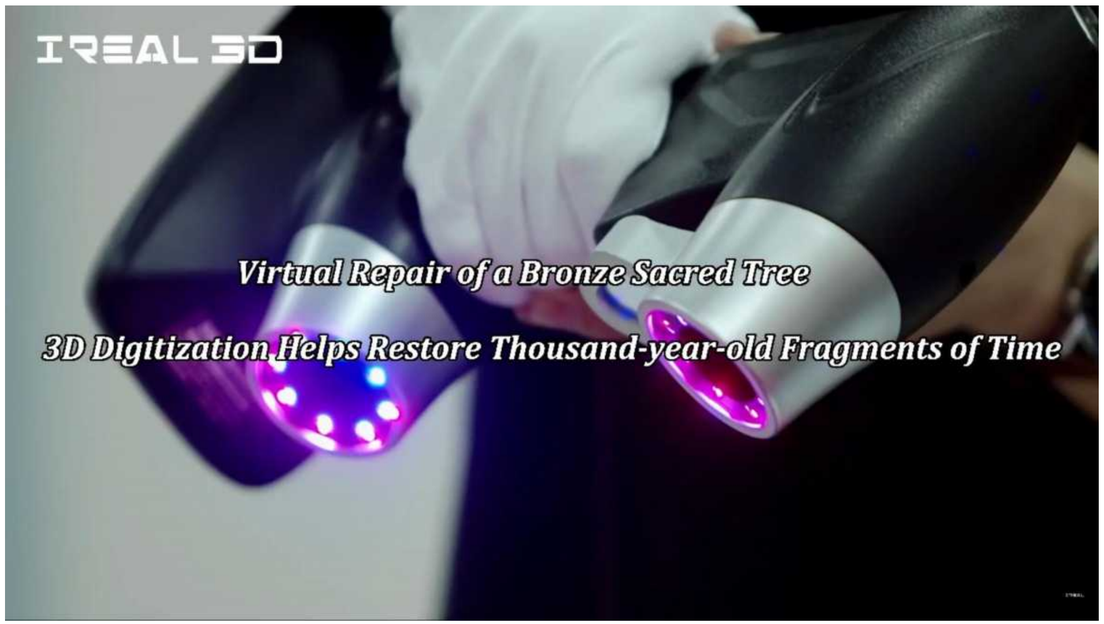
There are three major types of 3D models that 3D digitization of cultural relics normally outputs:

- High-precision 3D model: used in data archiving, scientific research analysis, heritage restoration, 3D printing and reproduction, damage identification, etc.;
- Line map of cultural relics: Draw line maps faster based on 3D models, record relics scientifically and vividly in the form of points, lines and surfaces, and use them to study the decoration, craftsmanship and other information on cultural relics;
- True color 3D modeling: applied to digital display system, panoramic reconstruction of virtual exhibition hall, animation production of education display, 3D model display system on mobile terminal (such as WeChat), offline multimedia touch display system, etc.

04 Case Study: Yunnan Lufeng Dinosaur 3D Digital Protection

Watch the HD video of this case study:
https://www.youtube.com/watch?v=BGe6y84-kQo

04 Case Study: 3D Virtual Repair of Bronze Sacred Tree of Ancient Sanxingdui Ruins



Watch the HD video of this case study:
https://www.youtube.com/watch?v=mQC_1QmNXL4

04 Case Study: 3D Restoration of Yungang Grottoes

先把整个石窟定位在坐标系当中

然后回去拿扫描仪去扫那个点

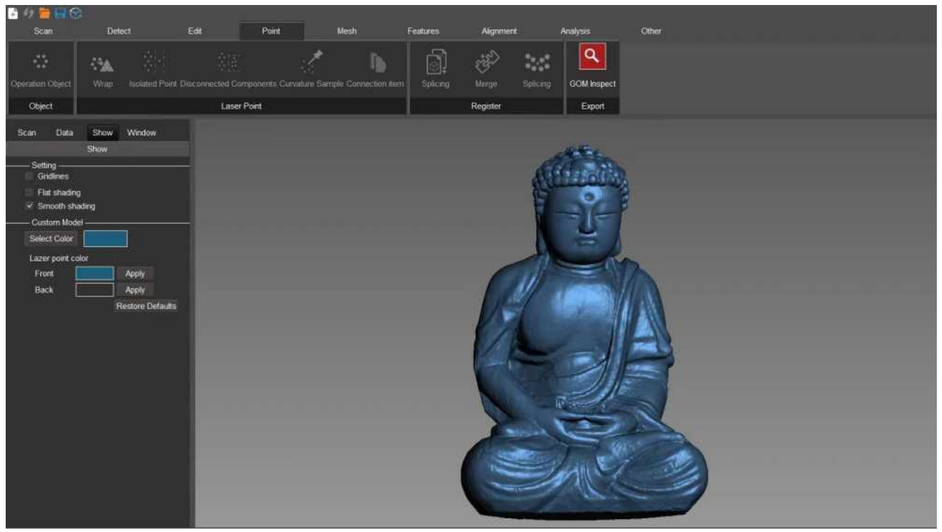
才能实现石窟的复制

原比例复制了云冈石窟第12窟

Cultural conservation workers of Zhejiang University restore the world cultural heritage: Yungang Grottoes in 1:1 ratio, through Scantech 3D scanning and 3D printing technology to regenerate cultural relics!

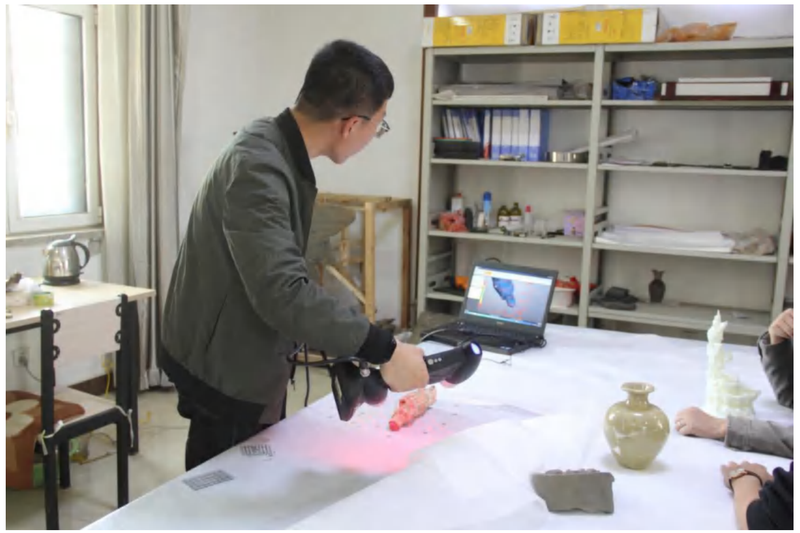
04

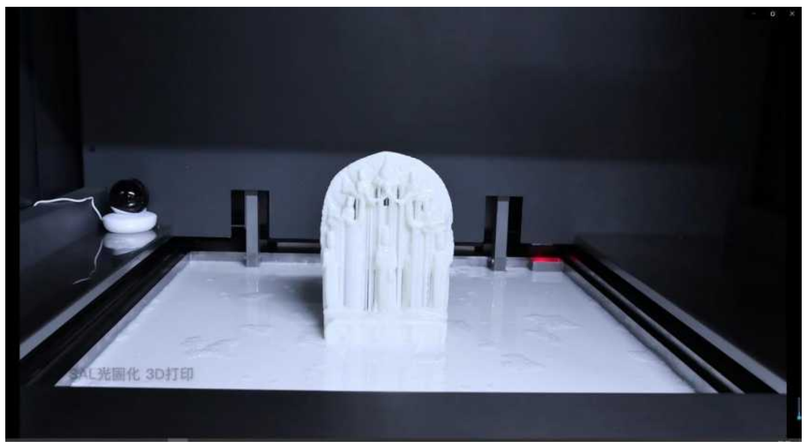
Case Study: 3D Restoration of Yungang Grottoes



Watch the HD video of this case study:
https://www.youtube.com/watch?v=oJnW2X7OIaI&t=2s

04 Case Study: 3D Restoration of Yecheng Museum





Scan the QR code to view the full story

Watch the HD video of this case study:
https://www.youtube.com/watch?v=ju13o5ePlUU&t=130s

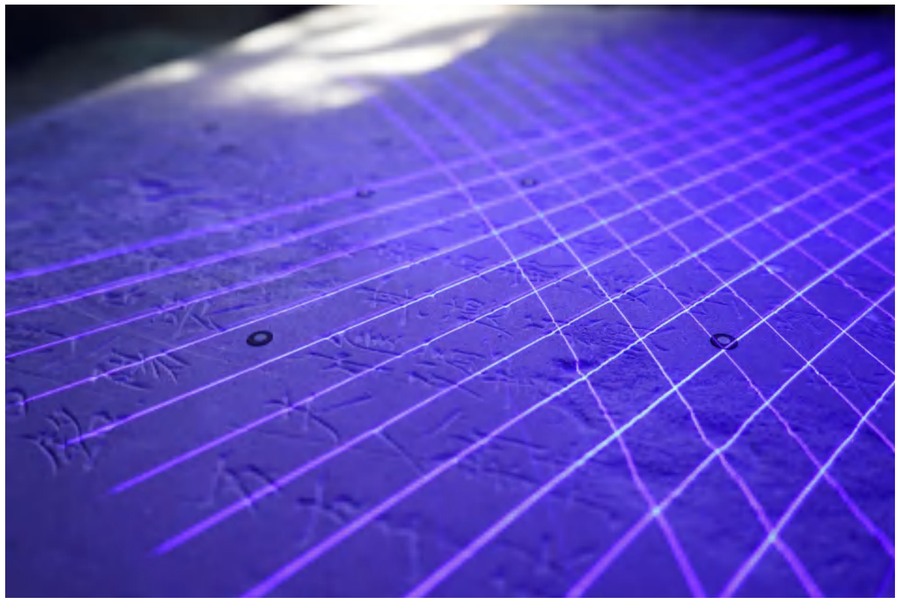
04 Case Study: 3D Printing and Restoration of Root Carving

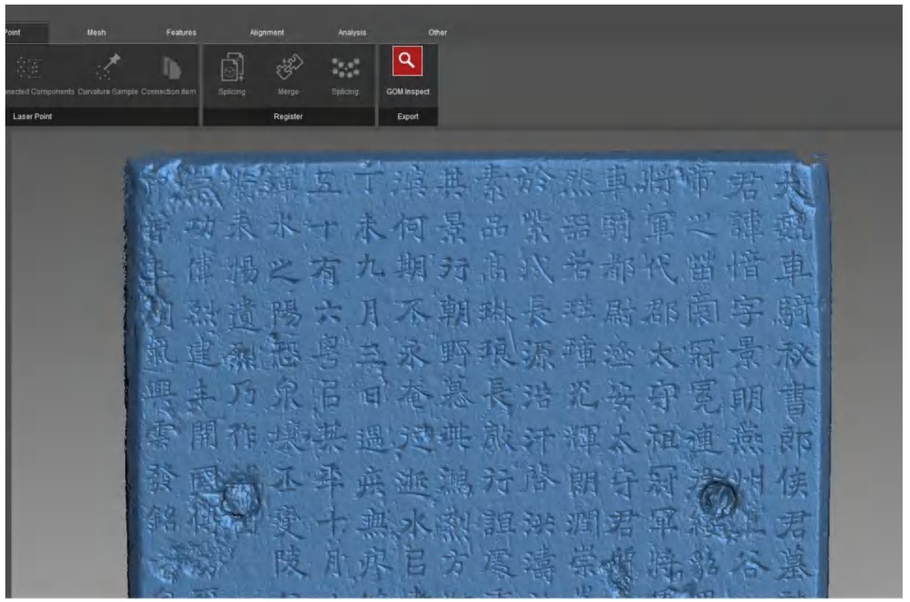
04 Case Study: 3D Derivative Production of Wulin Ancient Building

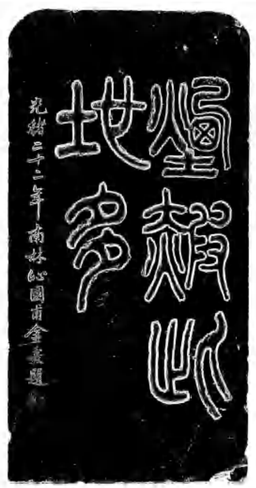
Field study → Partial scanning of buildings → Data processing (forward + reverse) → 3D printing

04 Case Study: 3D Data Archiving of Cliff Inscriptions

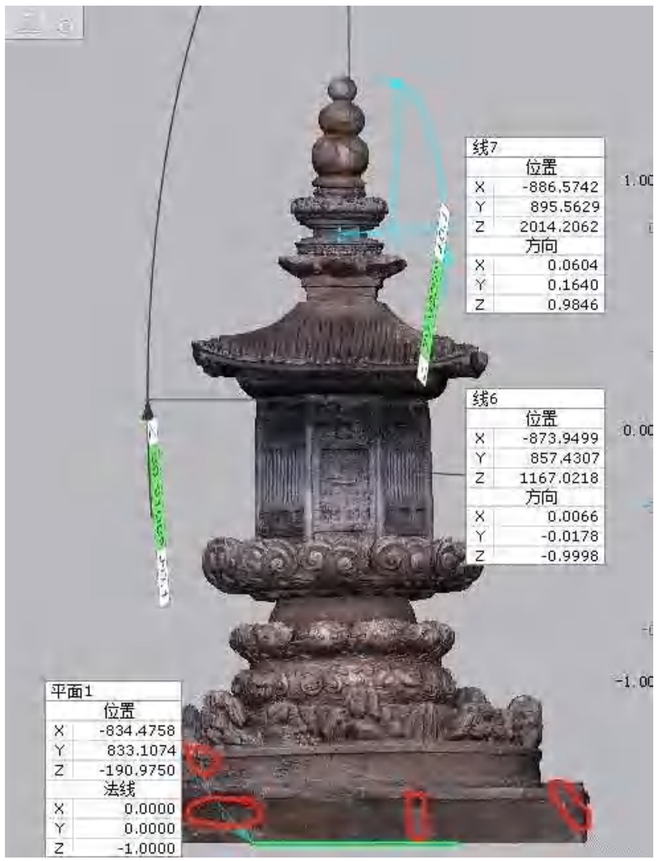
04 Case Study: 3D Rubbings of Ancient Epitaph







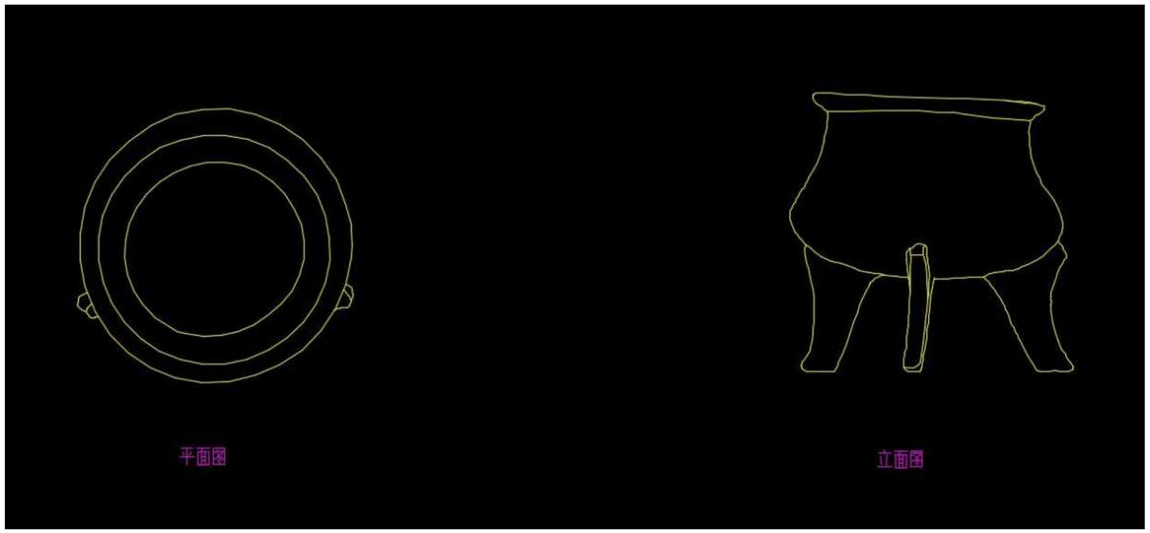
04 Case Study: 3D Mapping Analysis of Xi'an Caotang Temple

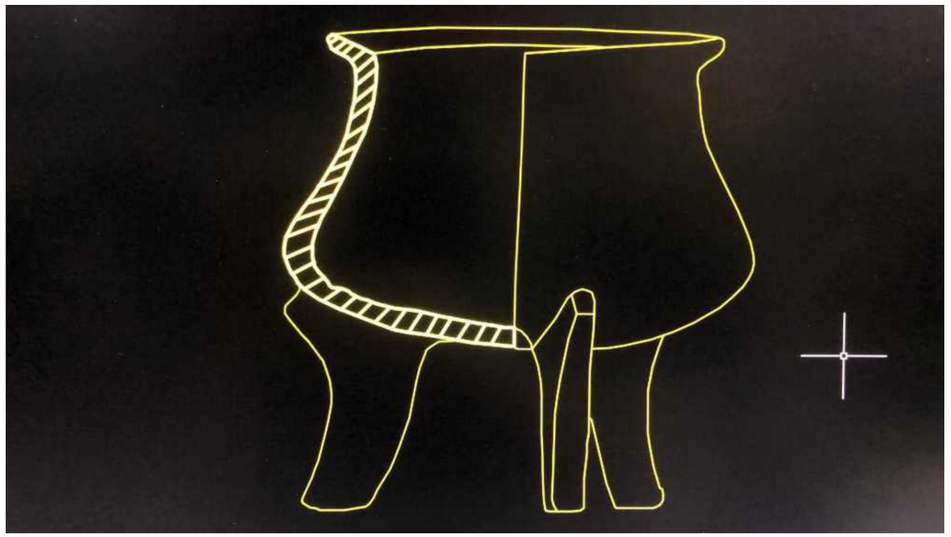


3D data archiving and 3D measurements of key sizes/angles

04

Case Study: 3D Scanned Model Helps Accurate Line Drawing





Through 3D scanned models, the line diagram of the utensil of different angles can be depicted more accurately.

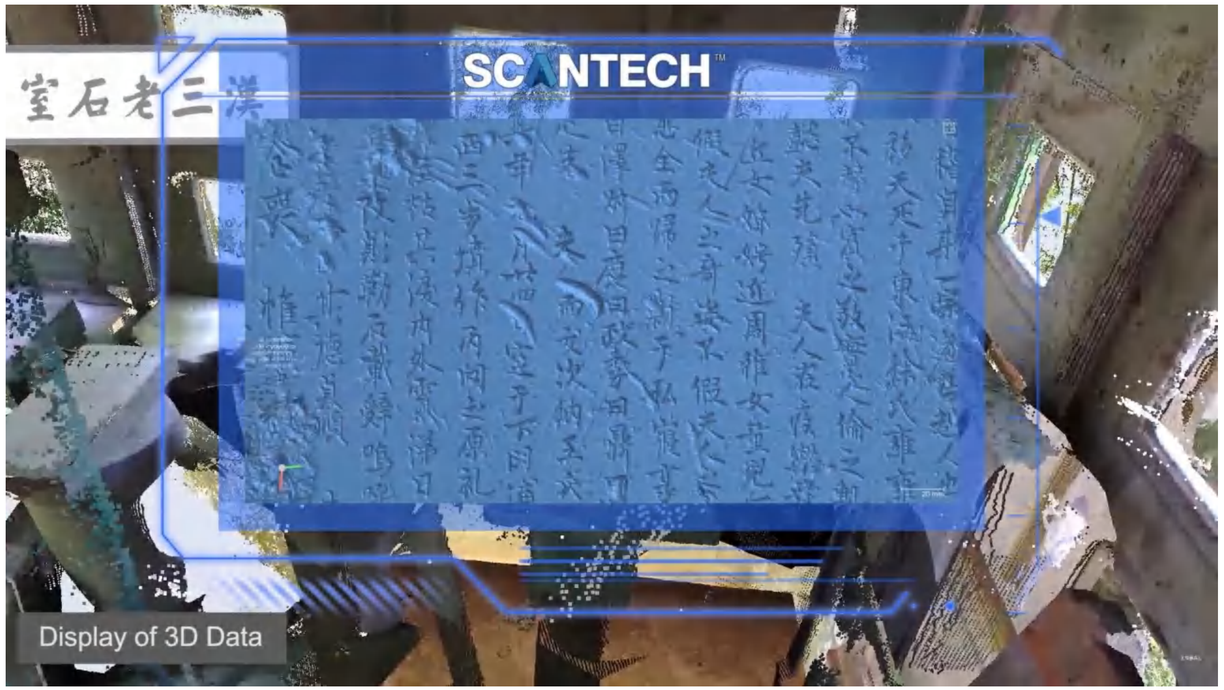
Line artwork of cultural relics: scientifically and vividly record and express cultural relics in the form of points, lines and surfaces.

04 Case Study: 3D Digital Exhibition of Folk Culture in Saihan District

Watch the HD video of this case study:
https://www.youtube.com/watch?v=r0YisFkWD5g

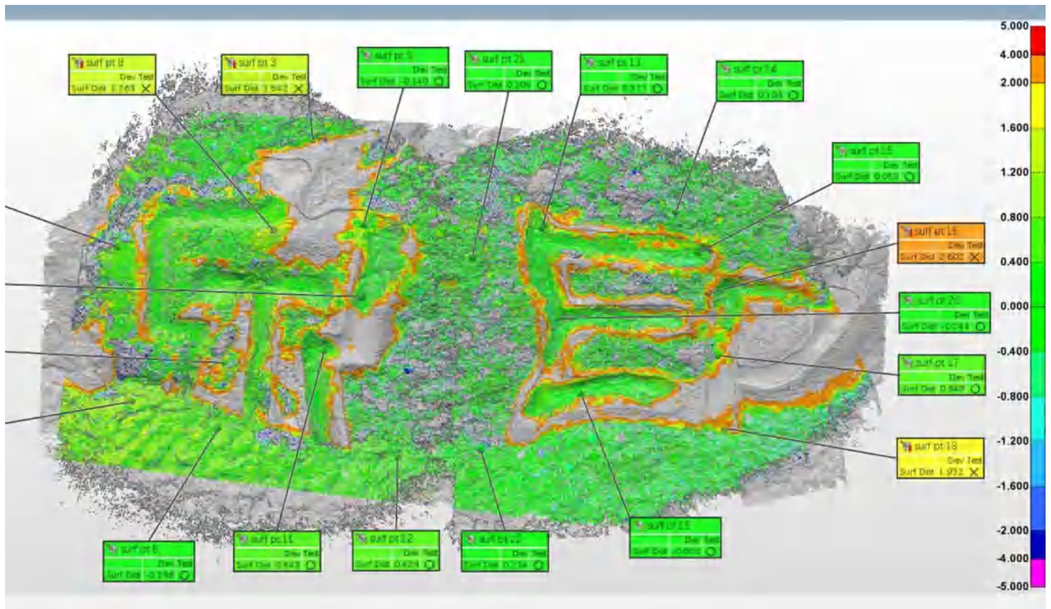
04 Case Study: Online 3D Exhibition of Jingdezhen Ceramic Institute

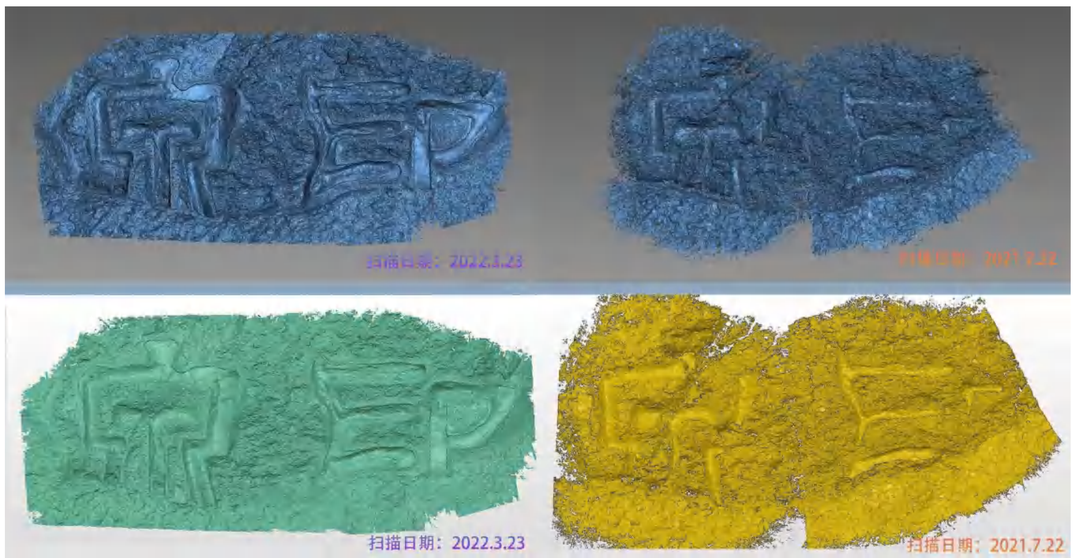
04 Case Study: 3D Digital Monitoring and Protection of Three Elders' Stela



Watch the HD video of this case study:
https://www.youtube.com/watch?v=ms8H0qFs0b0

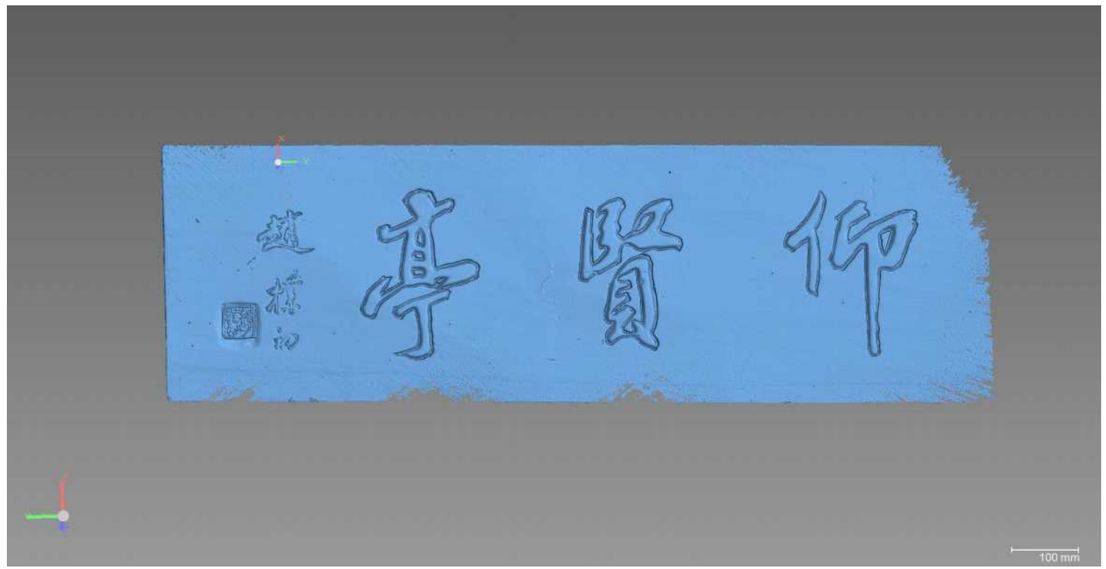
04 Case Study: 3D Digital Monitoring and Protection of Xiling Seal Art Society

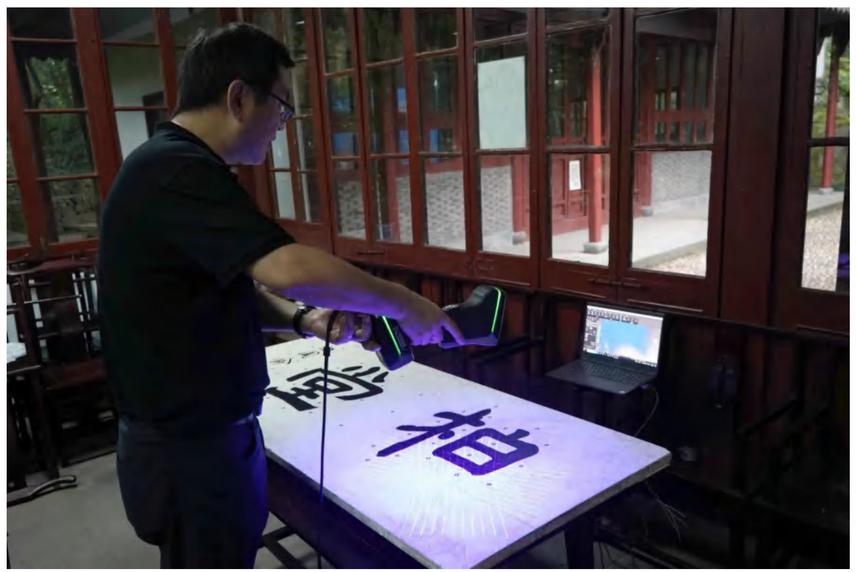


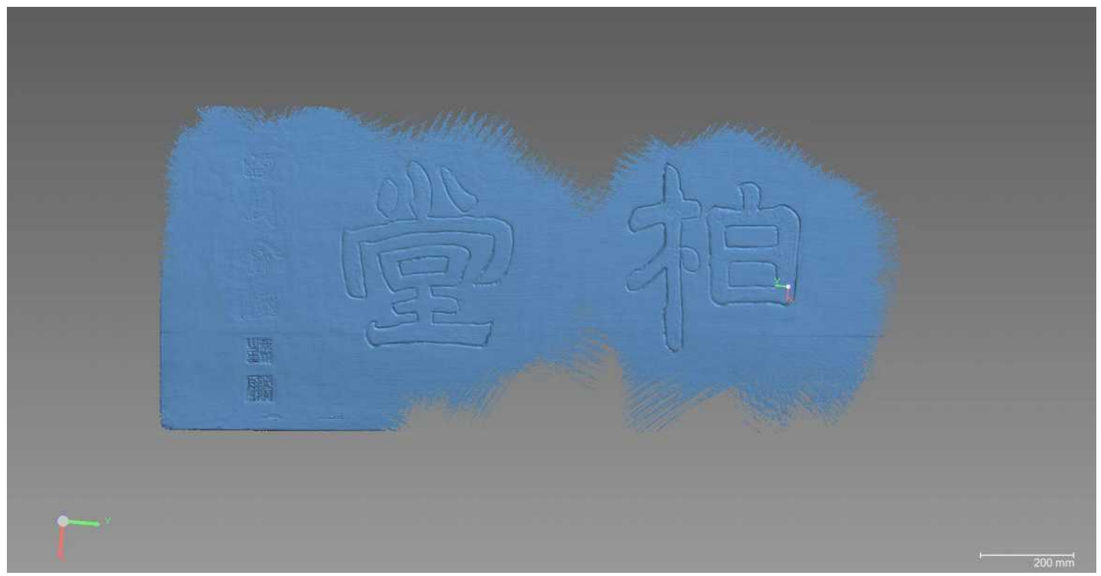


04

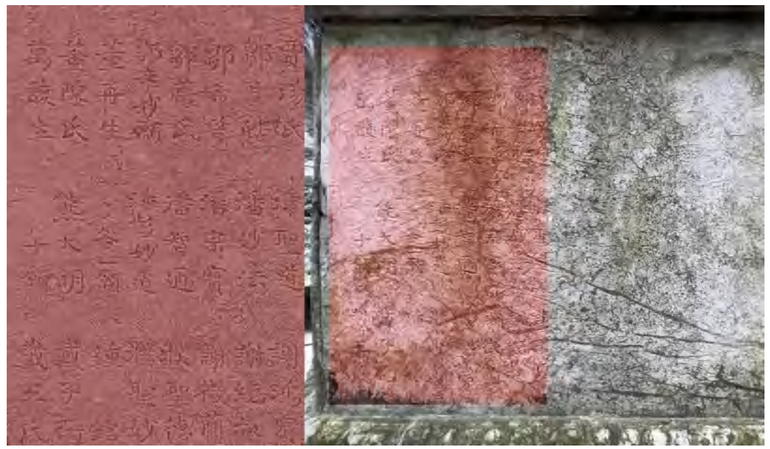
Case Study: 3D Digital Archiving of an Ancient Plaque







04 Case Study: 3D Digitization of Inscriptions on an Ancient Tower



05 True Color 3D Digitization Solution-Handheld Color 3D Scanner

Process: 3D scan directly to obtain color 3D data on the surface of the item

No post-processing (complete scan data, and low requirements for color restoration): export obj format, directly used for 3D printing, 3D data analysis/archive/3D display.

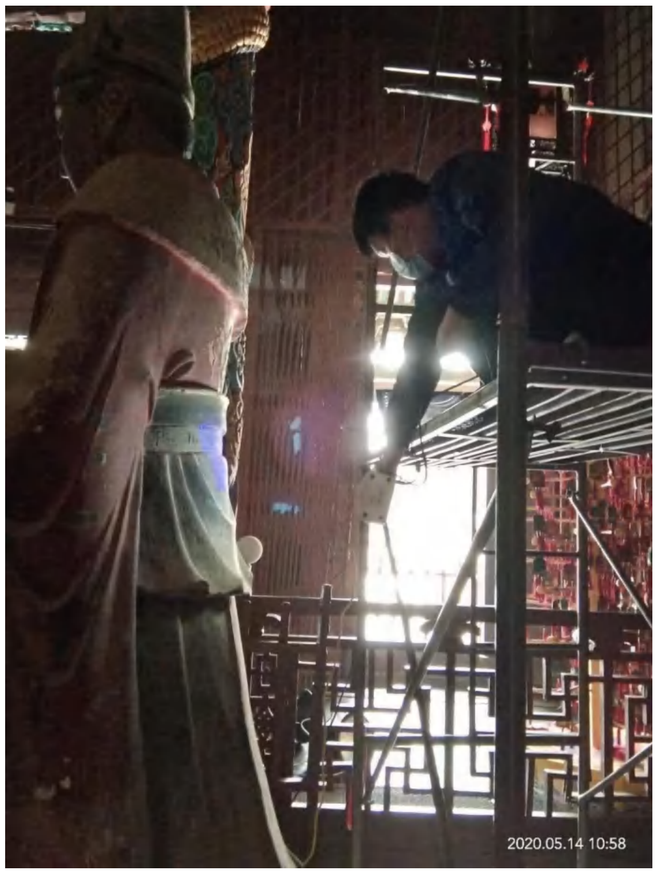
Post-processing is required (the data is incomplete, or the color requirements are a bit high): the exported obj data is combined with the photos taken by the SLR in a uniform light environment from various angles, and imported into iReal 3D mapping software for smart texture mapping to get a HD color 3D model.

Main software used for data post-processing: iReal 3D mapping software, Photoshop

Other software might be used for data post-processing: Geomagic Wrap、ZBrush、Marmoset Toolbag

05

True Color 3D Digitization Solution-Handheld Color 3D Scanner



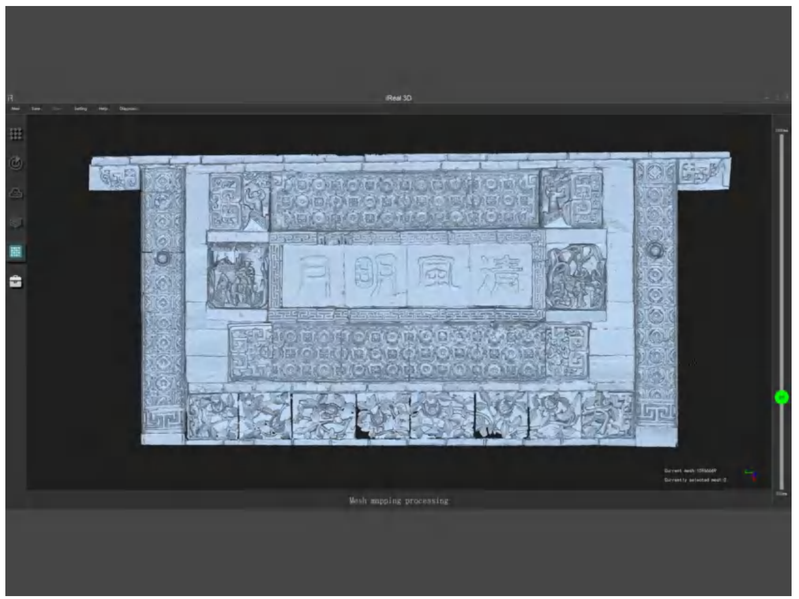
3D Scanning an Ancient Temple in Shanxi Haizhou

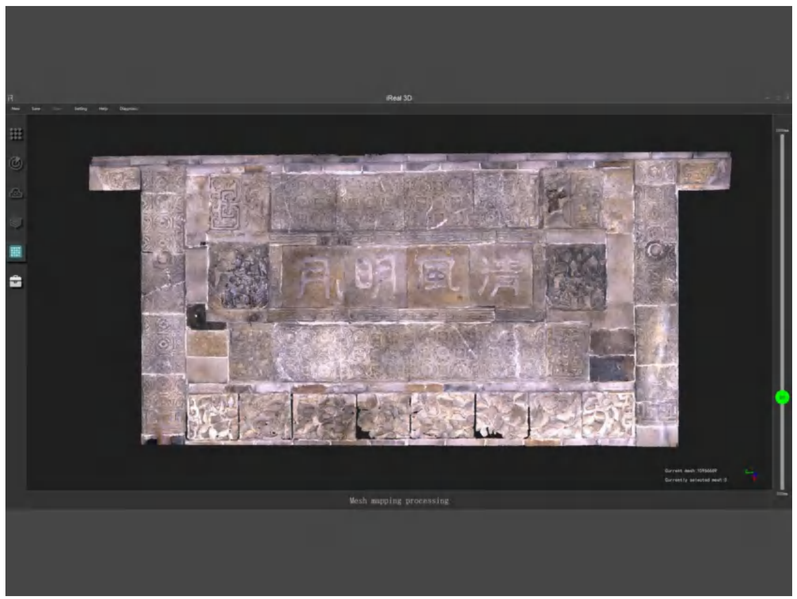
Among the numerous state-protected ancient buildings in Shanxi, the Haizhou Guandi Temple has a unique cultural significance. As the carrier of Guan Gong culture, Haizhou Guandi Temple is the earliest, largest, highest-grade and best-preserved Guandi temple in China, known as "the crown of martial arts temples".

05 True Color 3D Digitization Solution-Handheld Color 3D Scanner

Chinese National Key Cultural Relics Protection Unit (Three Saints in the West)

05 True Color 3D Digitization Solution-Handheld Color 3D Scanner





3D digital archive of ancient building exterior walls

05 True Color 3D Digitization Solution-Handheld Color 3D Scanner

Process

1. 3D scan to obtain 3D data (monochrome) of the surface of the item, such as stl, obj.
2. Optimize the acquired 3D data through 3D software (filling holes, carving, reducing surfaces, etc.);.
3. Obtain pictures from all angles of the item through the SLR in a uniform light environment.
4. High-efficiency texture mapping is achieved through the iReal 3D mapping software.

Data acquisition hardware equipment: handheld laser 3D scanner, SLR and shooting kit (fill light, color calibration card, automatic turntable)

The post-processing software mainly involves: iReal 3D mapping software, Photoshop

Other post-processing software: Geomagic Wrap, ZBrush, Marmoset Toolbag

05 True Color 3D Digitization Solution-3D Laser Scanner+iReal 3D Mapping

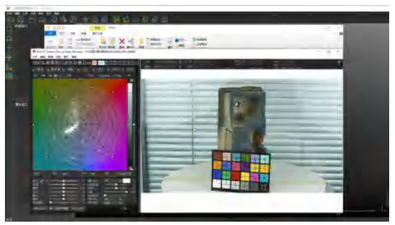
1. DATA COLLECTION

Laser 3D Scanning

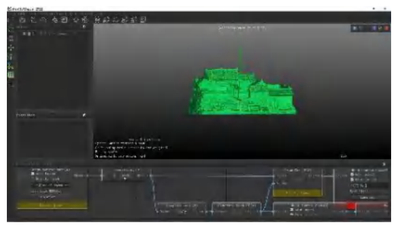
Photos Collecting

2. PRE-PROCESSING OF MODELS AND PHOTOS

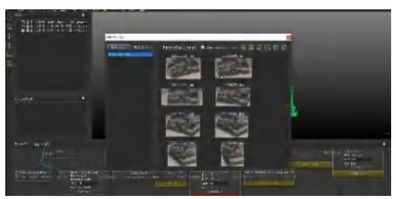
Photos Color Adjustment



Mesh Pre-processing

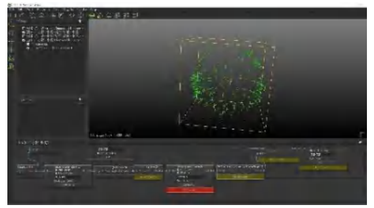


Photos Object Extraction



3. FULLY AUTOMATIC MAPPING

Relative Orientation



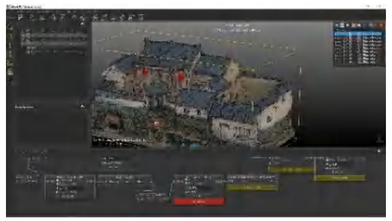
Absolute Orientation

Fine Registration

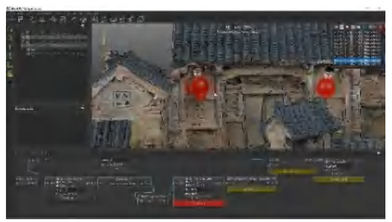
05 True Color 3D Digitization Solution-3D Laser Scanner+iReal 3D Mapping

4. SMART MAPPING

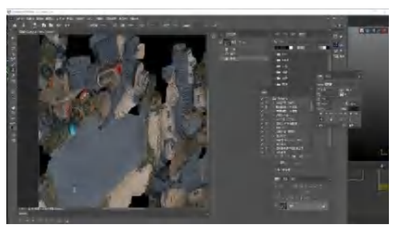
Automatic Mapping



Seam Editing

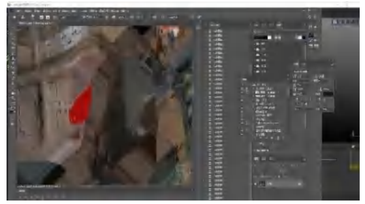


Smart UV Generating and Transfering

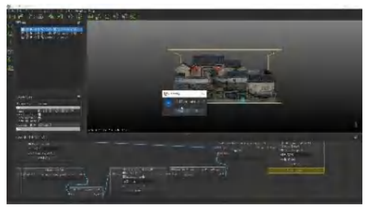


5. MAPPING EDITING AND BAKEN

Refine Textures Linkage Photoshop



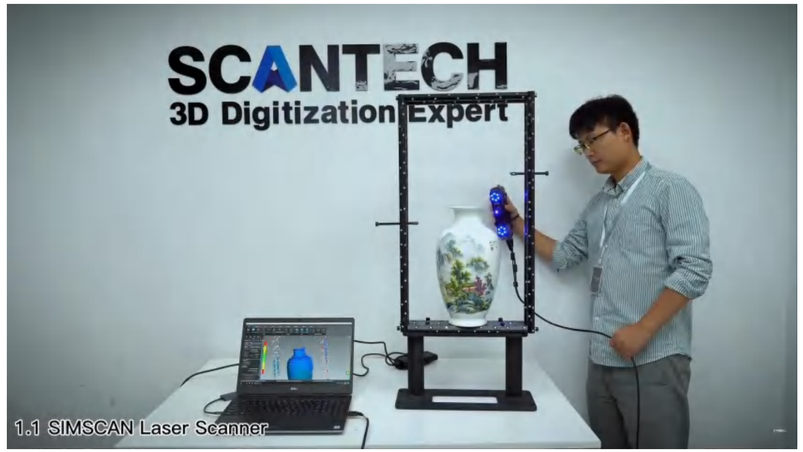
Uniform after Refine Textures

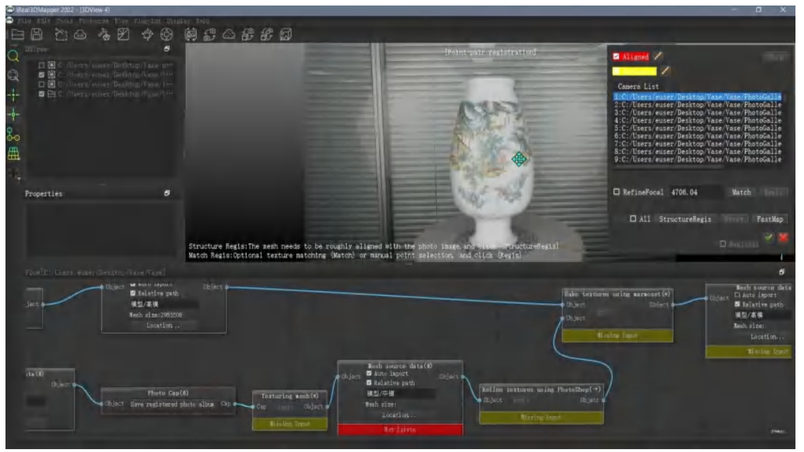


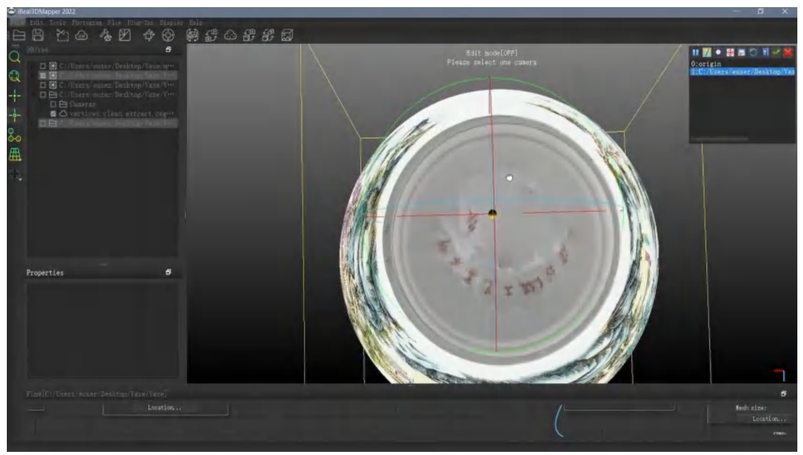
Bake Albedo and Normals

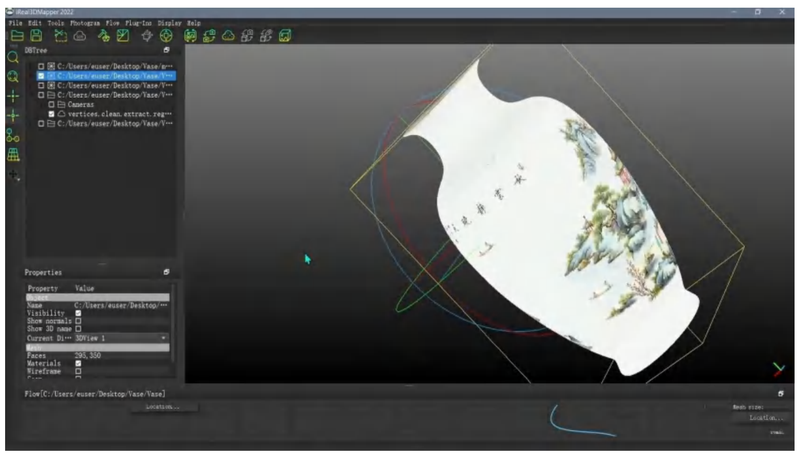
720°HIGH-PRECISION MAPPED MODEL

05 Whole Process of Porcelain Texture Mapping (Video Tutorial)









Complete video tutorial:
https://www.youtube.com/watch?v=2TAbir3akIc&t=7s

06 Overview-True Color 3D Digitization Solution

Necessary skills: 3D scanning, professional SLR photography, Adobe Photoshop

Model optimization software: Geomagic Wrap, ZBrush, 3DS Max, etc.

Texture mapping software: iReal 3D mapping software, Adobe Photoshop

Products, Solutions&Services Available:

1. 3D scanners and iReal 3D mapping software for sale

2. Value-added services for Scantech users: such as data post-processing, texture mapping services, assisting in solving large quantities/difficult parts processing, etc.

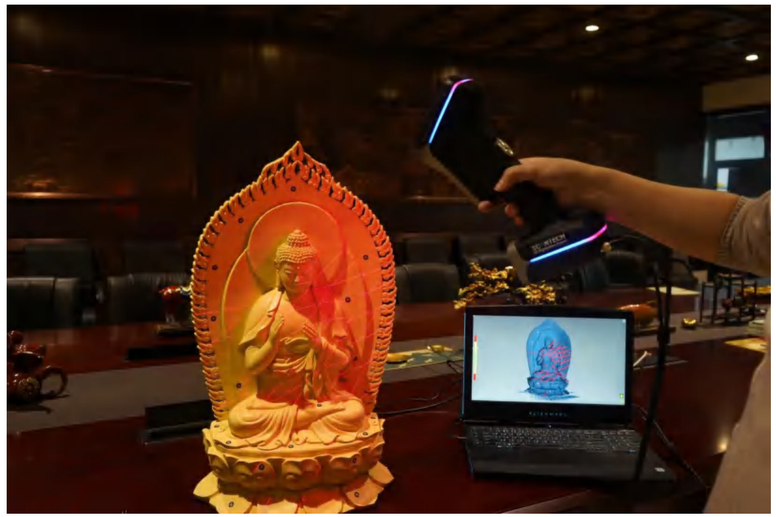
The optimal solution for high-precision 3D digitization of cultural relics:

- Reverse modeling (mainly with handheld 3D laser scanners, supplemented by handheld speckle scanners) + 3D modeling/3D model optimization + SLR + texture mappings.
- If there are many types of materials and sizes to be scanned, it is recommended that various tools (different types of 3D scanners) be flexibly matched to be the best solution.

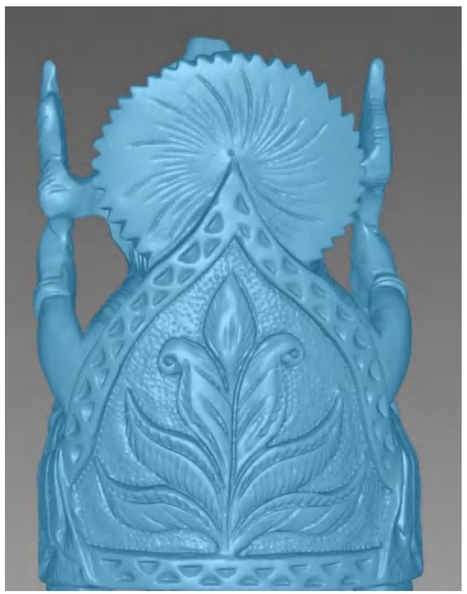
High-precision, High-definition Color 3D Modeling Solution

Step	Device/Software	Recommended model	Function	Note
3D scan	3D scanner	KSCAN-Magic 3D laser scanner	Obtain high-precision 3D models	Or TrackScan series
	Mobile workstation	DELL Mobile Precision 7560	3D scanning and data processing	
SLR camera	SLR camera + tripod	Sony Alpha 7RIII A7RM3A Full-frame Microless (Pixel 4240w) + regular lens + macro lens	Obtain multi-angle HD photos	Or EOS 5DSR 5060w pixels
	Macro ring flash	/	Ensure that small objects receive even light when shooting	
	Soft light set	Three fill lights + one ceiling light stand + one softbox	Ensure that medium-sized objects receive even light when shooting	With the ring fill light, it can meet the shooting requirements of more size items
	Color check	X-Rite colorchecker classic	Guaranteed low chromatic aberration in the photos taken	
	Automatic turntable	360 degree automatic turntable (programmable)	Link with the camera to automatically take pictures	
	Patterned pad	Customized (The standard patterned pad patterns we provide can be printed on A3/A4 paper)	Improve the efficiency and accuracy of post-photo positioning calculation	
Data post-processing and smart mapping	3D post-processing software	Blender	Local refinement of 3D scanned models	Add-on Geomagic Wrap
	Smart mapping software	iReal 3D mapping software	Semi-automatic smart mapping	
	Photo editing software	Photoshop	Refine local maps	
	Color grading software	3D LUT Creator	Batch automatic color correction of captured pictures	
	Image texture and map generator	Marmoset Toolbag	Bake the texture of the middle model to the high model to generate high-precision, high-definition color 3D models	

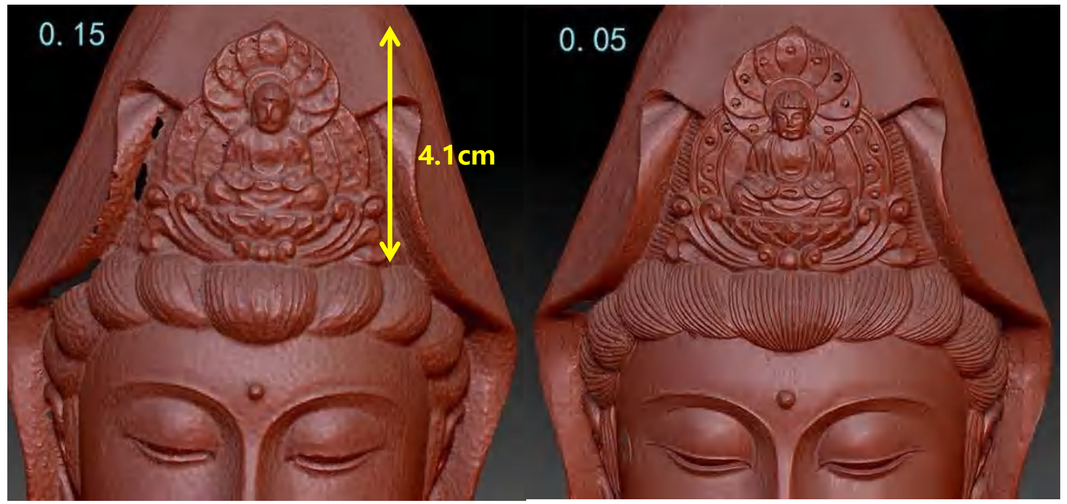
07 Other: High-precision 3D Scanning

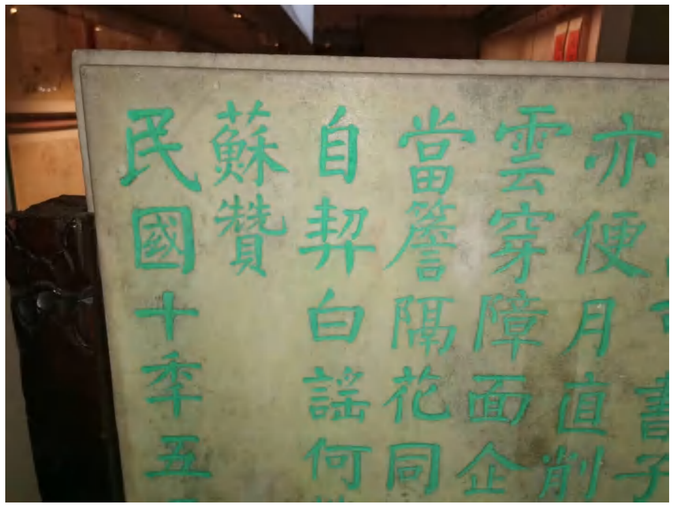


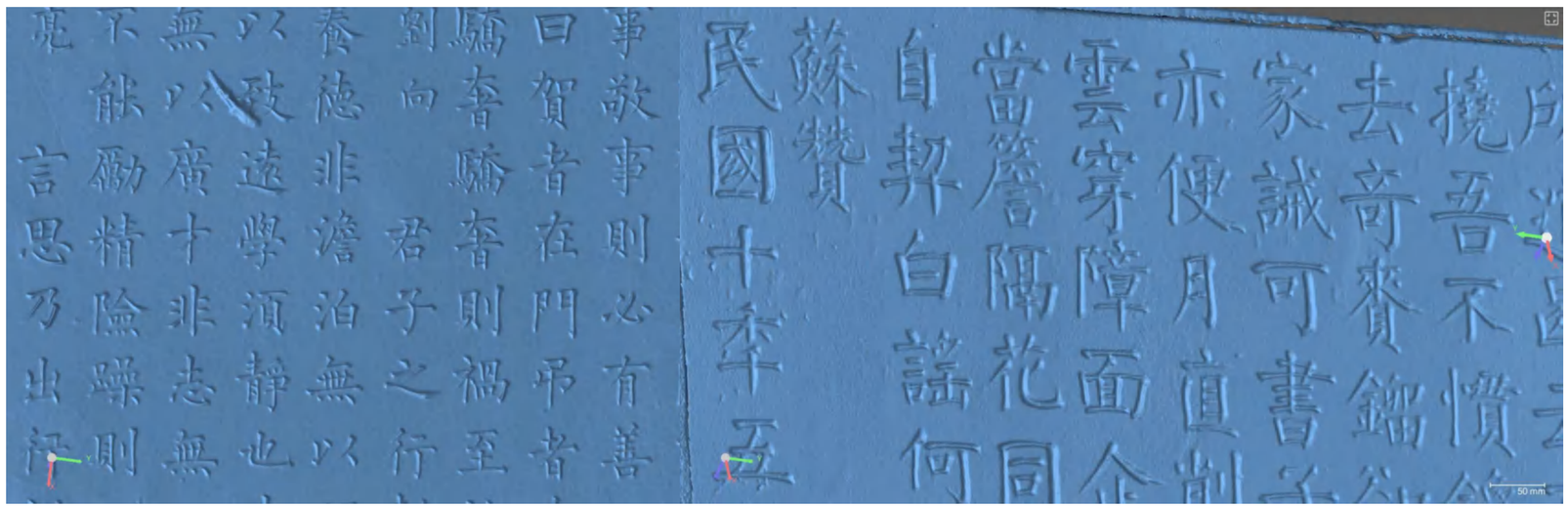
Watch the complete video of this case study:
https://www.youtube.com/watch?v=uQrYjNXywbE



07 Other: High-precision 3D Scanning







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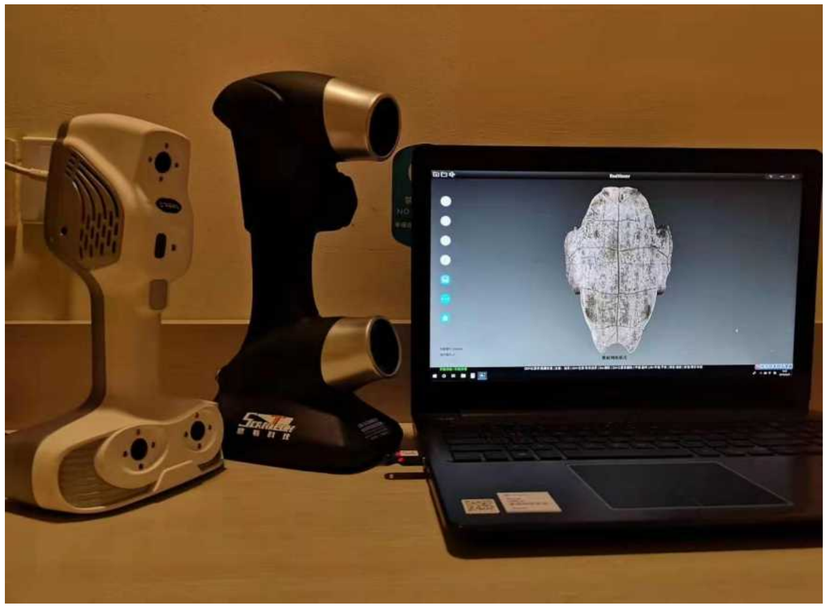
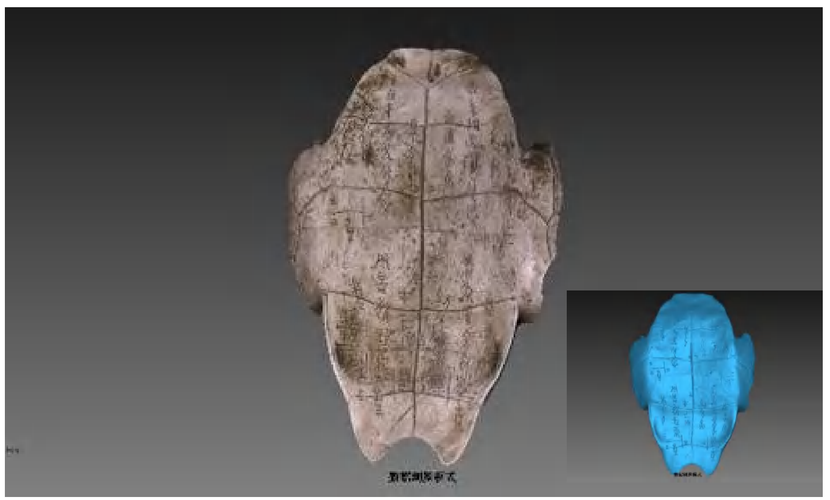
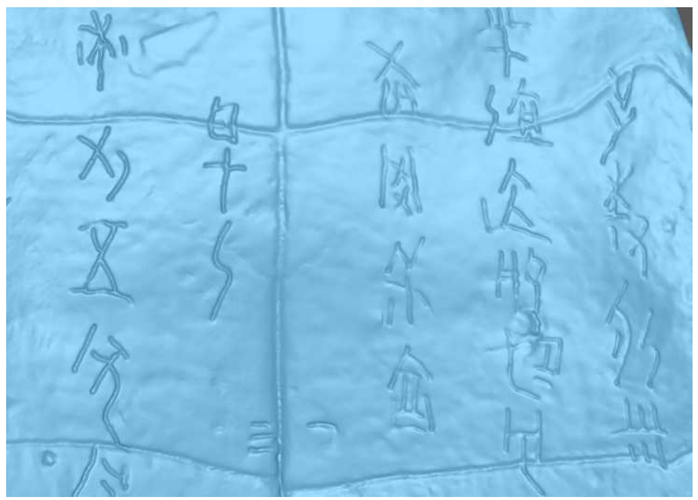
Other: High-precision 3D Scanning







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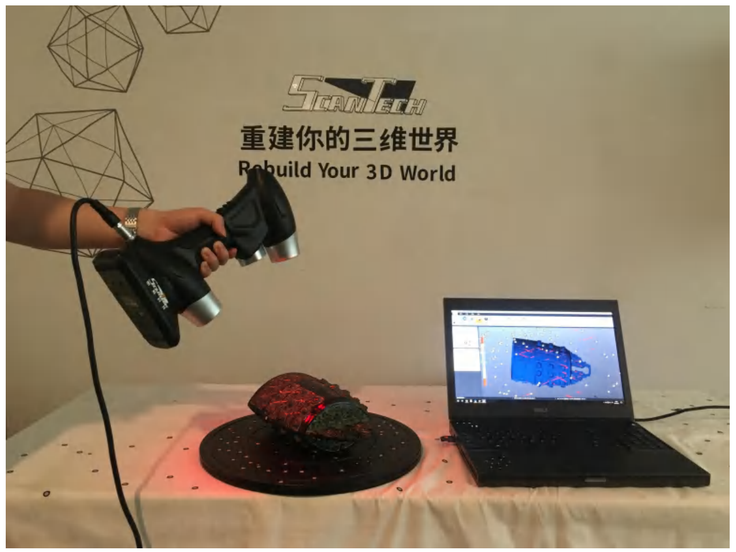
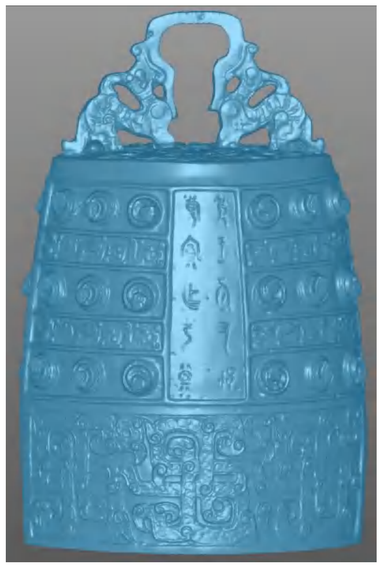
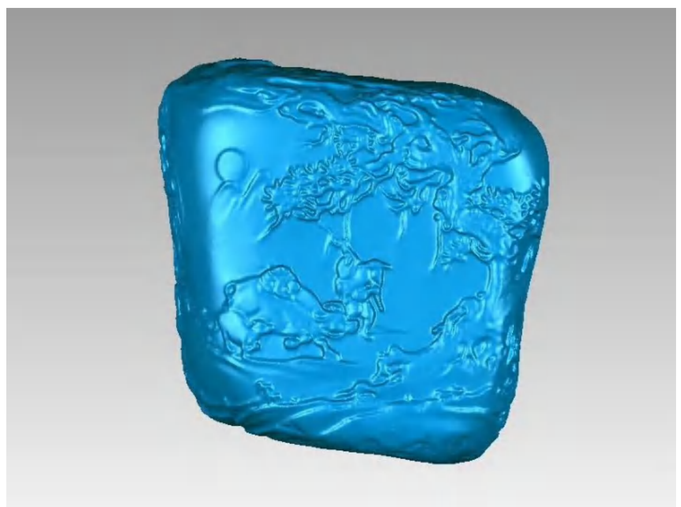
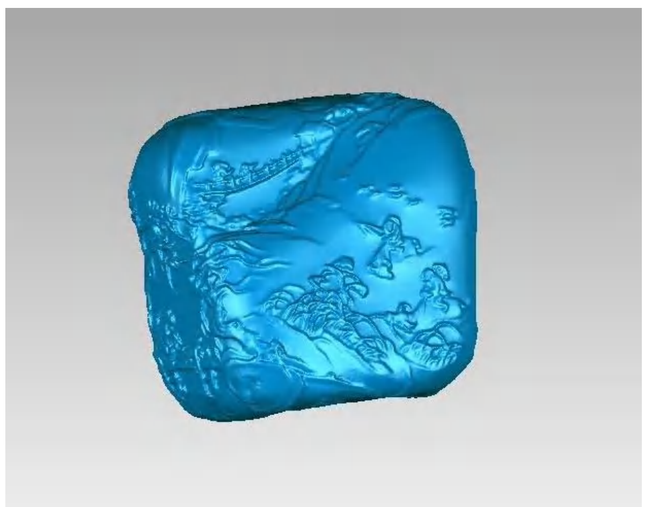
Other: High-precision 3D Scanning









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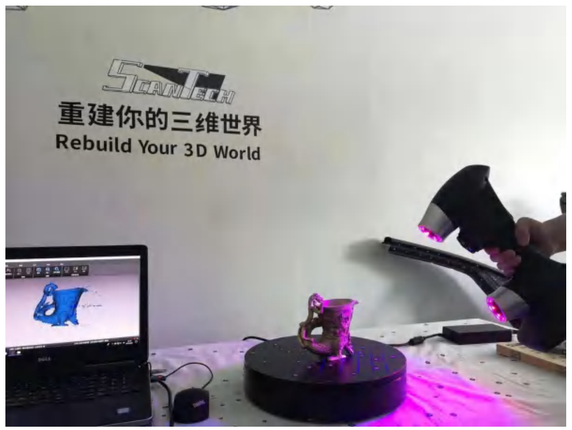

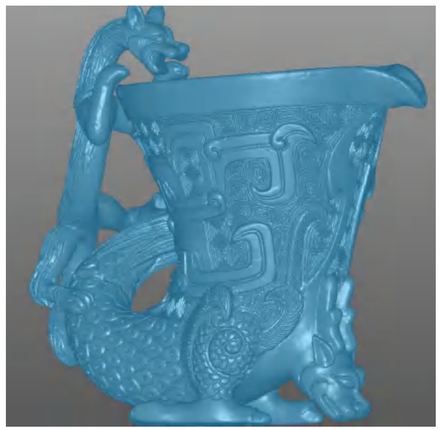

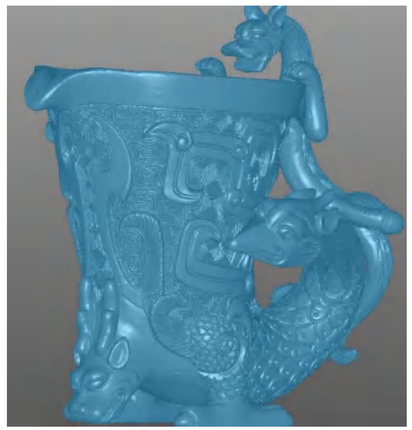

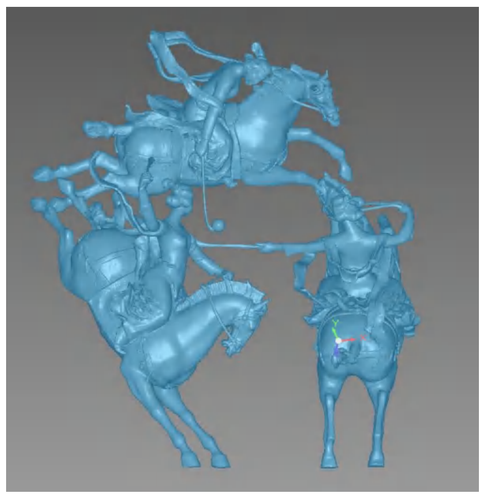

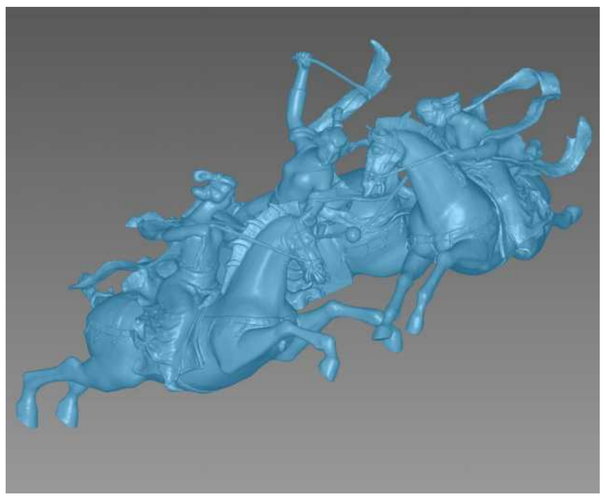

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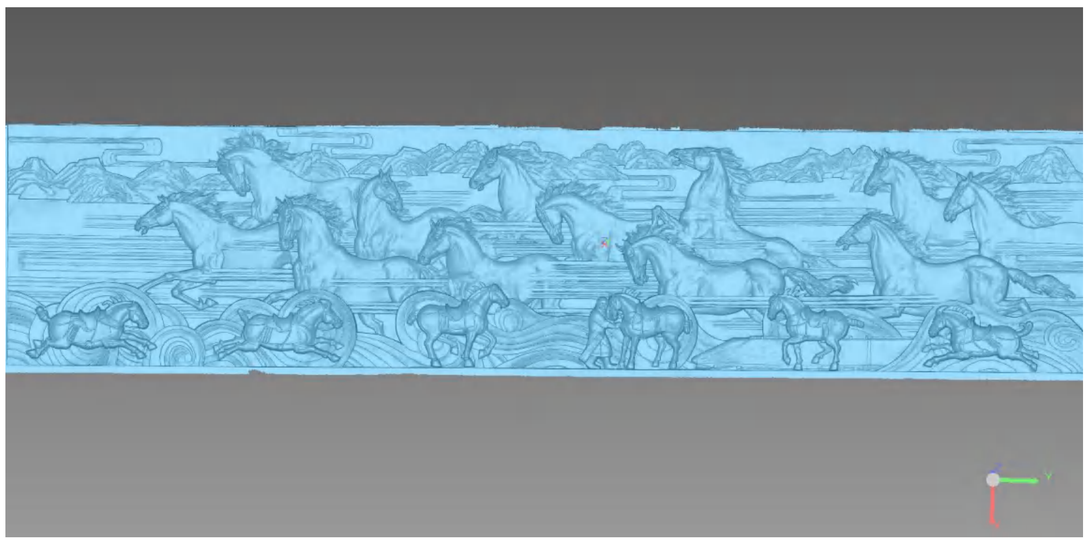

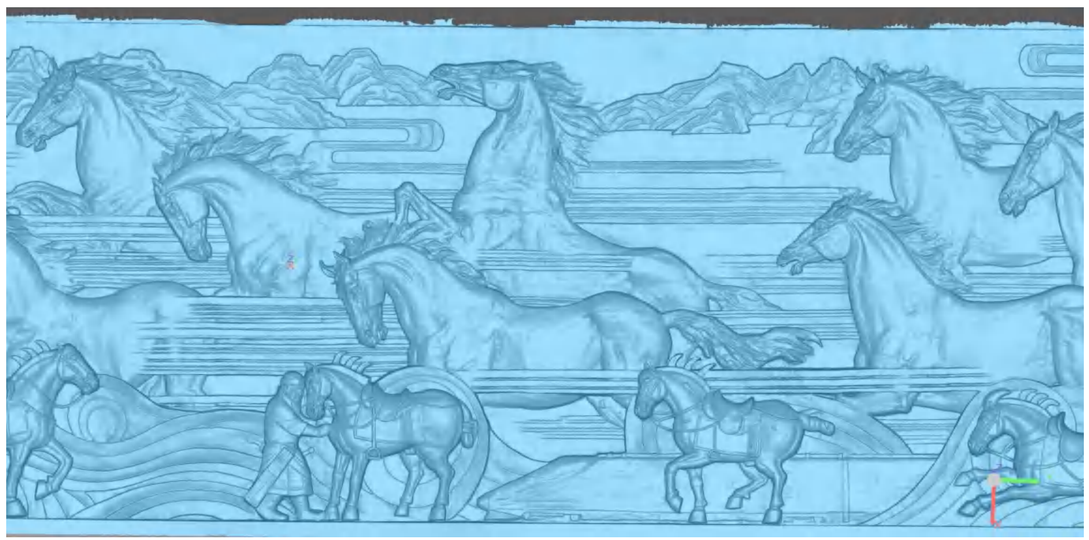

Huge relief: 14*3 m

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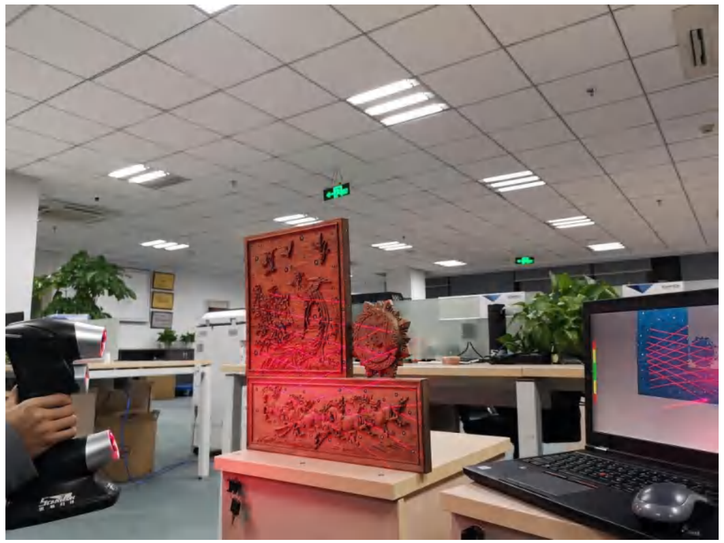
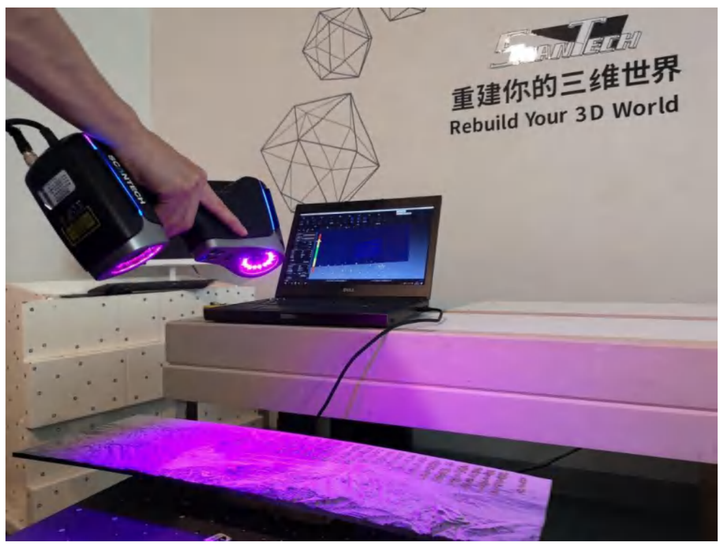
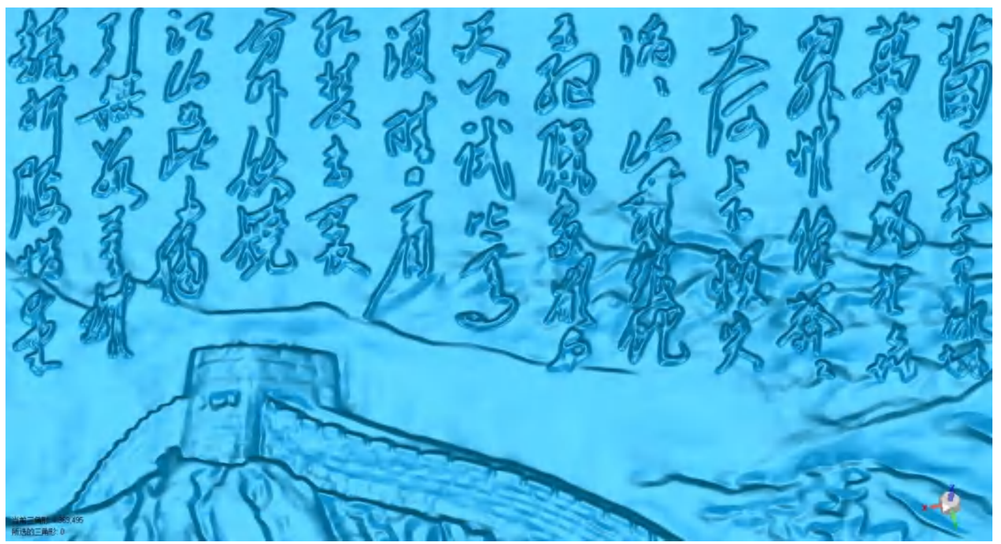
Other: High-precision 3D Scanning

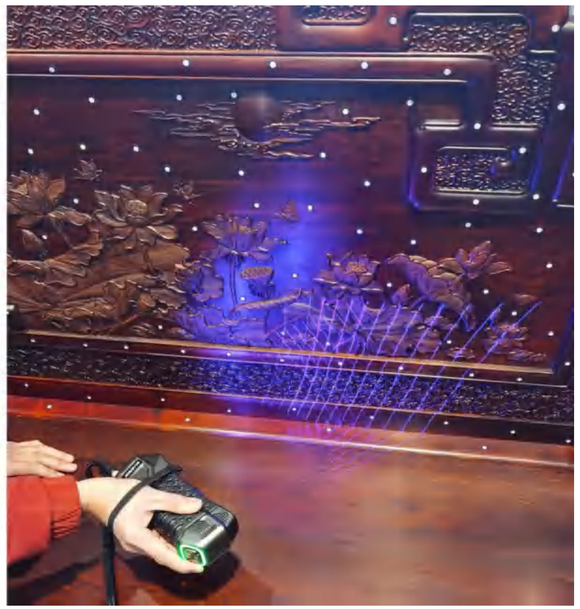


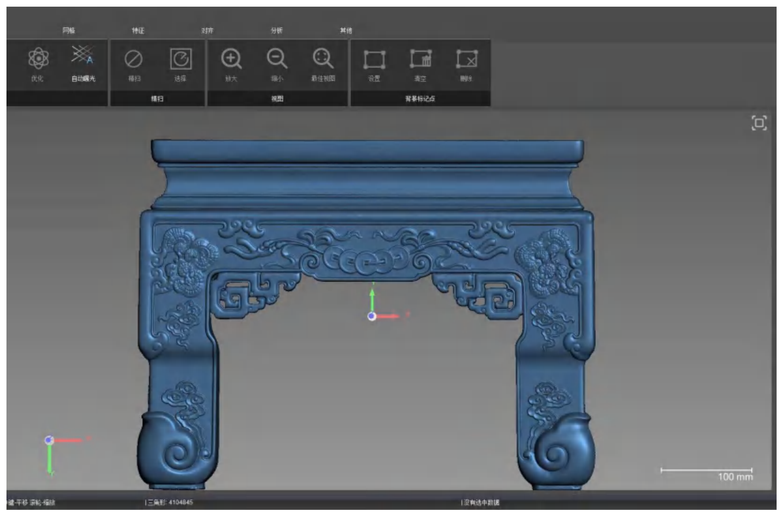




Wood carving artwork with rich details - plane carving

07 Other: High-precision 3D Scanning





IREAL 3D

THANK YOU