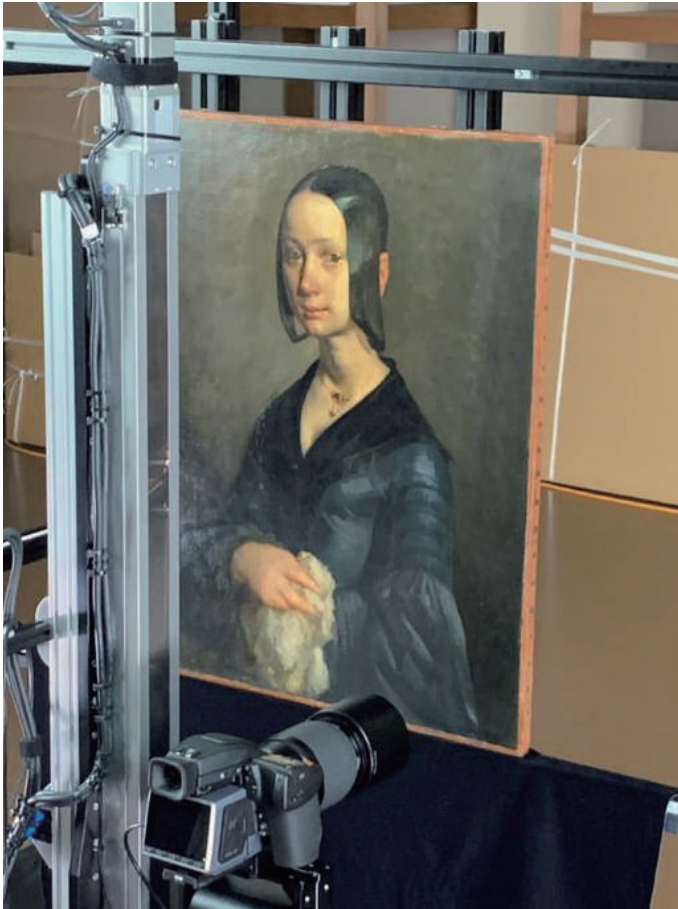


Passing On Culture to the Future

# Ultra-High-Definition 3DCG Image Solution for Cultural Assets



Portrait of Pauline-Virginie Ono  
(Yamanashi Prefectural Museum of Art)



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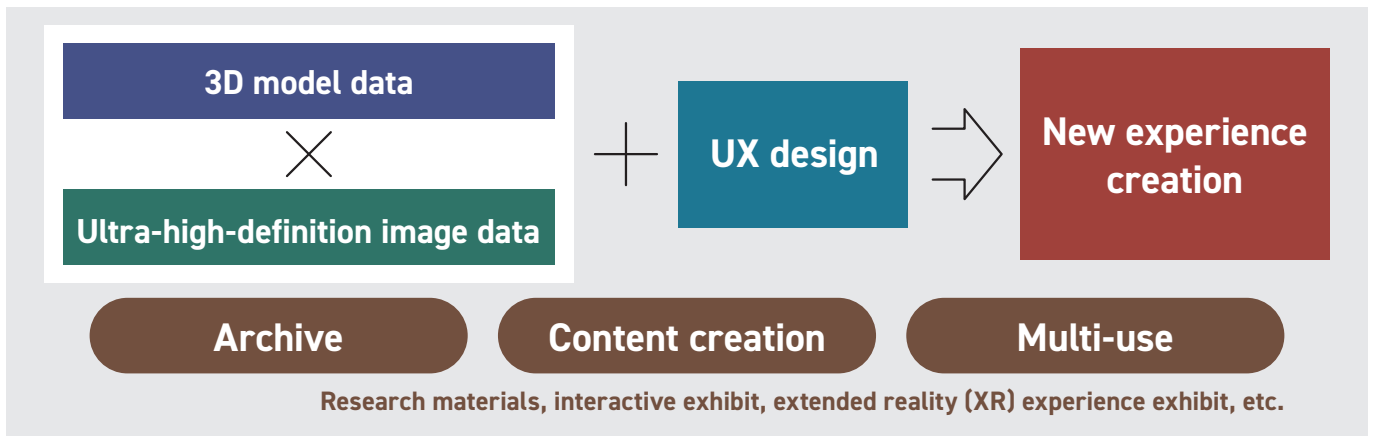
## Outline

NHK Enterprises has developed its own proprietary image solution workflow in the field of three-dimensional computer graphics (3DCG) utilizing an ultra-high-resolution camera, a 3D scanning system, and interactive production, etc. We create visual experiences in the digital and data era beyond the existing framework.

## Background

As media technologies such as photography, film, television, and virtual reality advance, our visual experiences also change. Today, we can view movies and programs in a 3D space that goes beyond the conventional 2D, 16:9 aspect ratio framework. Video images are also evolving from being created not only by shooting with cameras, but also by scanning and image-capturing of subjects. NHK Enterprises offers visual solutions in high-definition 3DCG by leveraging this constantly-evolving media technology with our expertise in planning and production cultivated through visual production over the years.

# 3DCG Image Solution Concept



## Features of the 3DCG Image Solution Offered by NEP

- Technology to create ultra-high-definition and realistic 3DCG
- Optimal recording recommendations to minimize the impact on the subject
- Reproduction of colors true to the actual object
- Planning and production skills cultivated by television and visual production of large-screen exhibits

## MoCoSS (Motion Control Scanning System for Ultra High Resolution Camera)

MoCoSS is a computerized recording system that controls everything including Phase One's 150-megapixel iXH 150MP camera system dedicated for recording cultural assets, motion control with a movement accuracy of 0.01mm, and lighting.

We take several hundred divided images for a single painting. Each piece is overlapped to enable the extraction of only the central part to avoid any distortion. These images are then woven together using digital stitching technology to create images with a huge pixel count.

Most experts agree that the smallest object the human eye can recognize is 0.1mm to 0.2mm, and the data obtained by the use of MoCoSS would contain detailed information surpassing our eyes' recognition by 40 to 80 times. This enables people to record, reproduce, and allow observation of so-called *matière*: brushwork details, bumps and dips on the surface of paintings in micro units.



### Motion Control Part

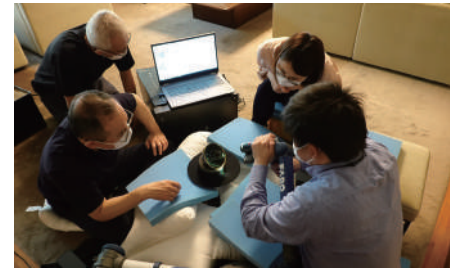
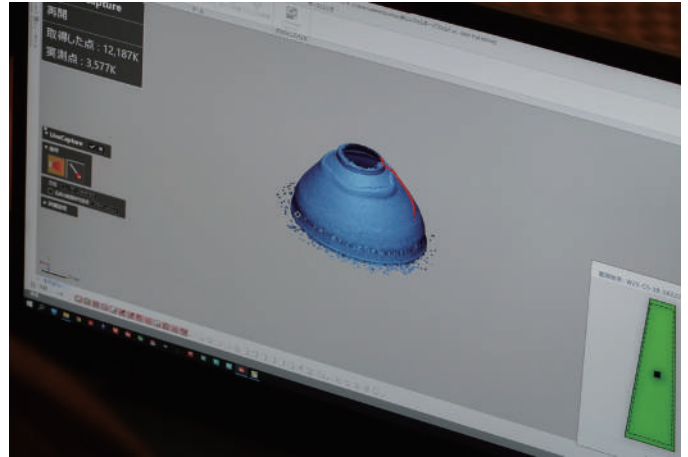
Recordable (movable) range	Width	84cm
	Length	84cm
	Depth	49cm
	Movement accuracy	0.01mm
	Movement speed	10cm/sec.

### Camera Part

Resolution	<b>150 million pixels</b> 120mm+Extension ring 21mm+42mm
Shortest distance	48.8cm from the sensor surface
Magnification	1:1.2
Recording range	64×49mm (W×H)
Resolution capability	0.0045 mm/pixel (The number of pixels in the lateral direction in 150MP is 14204)

# Ultra-High-Definition 3DCG

3D data of the recording subject is captured with a 3D scanner and then modeling is carried out by processing the data. After that, images photographed with a camera are pasted as texture on the created 3D model to complete an ultra-high-definition 3DCG model.



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# Interactive Exhibit System

This exhibit system portrays ultra-high-definition 3DCG model images in real time by using an accurate replica of the actual art piece created by a 3D printer as a controller.

The new experience with a cultural asset through the handling of a replica allows visitors to rediscover the allure of the piece in question, thereby creating new value.

## Tea bowl shaped controller



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## Sunflowers controller

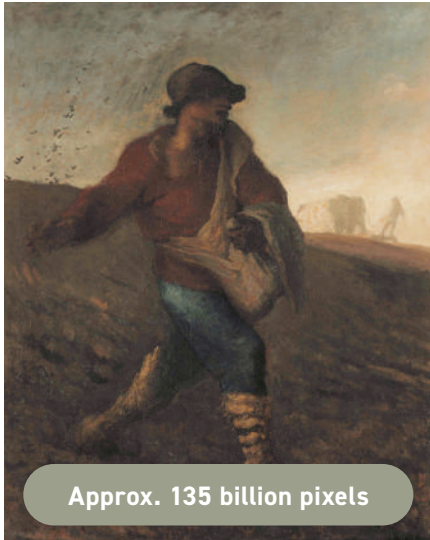


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# Achievements to Date

## 1. Digital photography services for works in Yamanashi Prefectural Museum of Art's collection

NHK Enterprises has been working on an ultra-high-definition digital archive of the Jean-François Millet collection in the Yamanashi Prefectural Museum of Art by using MoCoSS jointly with Television Yamanashi Co., Ltd. and Digital and Design Pictures, Inc.



Approx. 135 billion pixels

*The Sower*

(Yamanashi Prefectural Museum of Art)  
99.7cm × 80.0cm



Approx. 19 billion pixels

*Summer, The Gleaners*

(Yamanashi Prefectural Museum of Art)  
38.3cm × 29.3cm



Approx. 64.3 billion pixels

*The Return of the Flock*  
(Yamanashi Prefectural Museum of Art)  
53.5cm × 71.0cm

## 2. 3DCG Production of a National Treasure Tea Bowl (*Yuteki Tenmoku*), stoneware with oil spot pattern and iridescent luster on tenmoku glaze, owned by The Museum of Oriental Ceramics, Osaka

NHK Enterprises created a 3D digital archive of the national treasure Tea Bowl (*Yuteki Tenmoku*), stoneware with an oil spot pattern and iridescent luster on tenmoku glaze, in The Museum of Oriental Ceramics, Osaka. Under the supervision of the museum's curators, the digital archive was created utilizing high-definition 3D scanning data and 700 high-definition image cuts in a true likeness of the actual masterpiece. Museum visitors are able to appreciate the national treasure tea bowl from every single aspect in 3DCG by moving around the 3D replica with a controller. This interactive presentation is available to visitors as a permanent exhibit of the museum.



©The Museum of Oriental Ceramics, Osaka/NHK Enterprises

### Lighting Simulation:

A real-time simulation highlights the changing hues of the tea bowl as time passes during the course of a day in the *shoin-zukuri* style room.



Morning to afternoon



Evening



Night

©The Museum of Oriental Ceramics, Osaka/NHK Enterprises

### 3. 3DCG Production of Vincent van Gogh's *Sunflowers* at the Sampo Museum of Art

NHK Enterprises created 3DCG digital data of Vincent van Gogh's famous masterpiece, *Sunflowers*, jointly with Sampo Japan Insurance Inc. and the Sampo Fine Art Foundation.

The 3DCG was produced by pasting ultra-high-definition images using MoCoSS on existing 3D scanned data to enable a reproduction portraying Van Gogh's characteristic three-dimensional paint effect and creative elements in addition to minute details of the masterpiece.

In the exhibit, various restrictions were implemented for the protection of *Sunflowers*, but digital data true to the actual masterpiece allows visitors to closely admire the artwork.



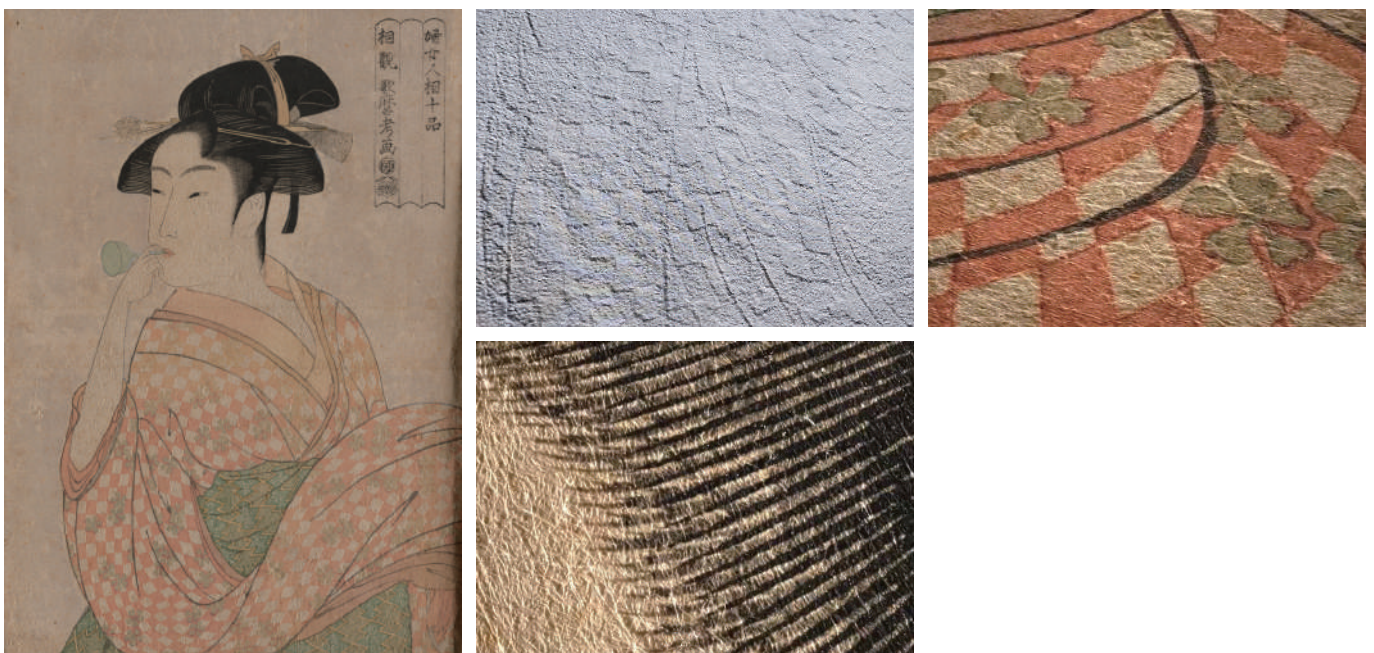
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### 4. 3DCG Production of a *Ukiyo-e* Woodblock Print in the Tokyo National Museum

NHK Enterprises created ultra-high-definition 3DCG digital data of a *ukiyo-e* woodblock print housed at the Tokyo National Museum.

A 3D model was created using a 3D scanner, which does not harm the artwork at all because it does not use ultraviolet rays. The concave and convex shapes of the woodblocks where the colors were applied were recorded with an accuracy of 0.4mm to realize the three-dimensional feel of a *Ichimatsu* kimono pattern.

Furthermore, the ultra-high-definition image recording enables the appreciation of fine details, even the strokes of hair in the *ukiyo-e*.



*Young Woman Blowing a Popen (glass noisemaker)* from the series *"Ten Classes of Women's Physiognomy" (Fujo ninsō juppen)* (Tokyo National Museum) © NHK/Tokyo National Museum

# Recreation of the Visual Experience by 3DCG Image Solutions

## Digital Archives

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MoCoSS can help preserve cultural properties for future generations by saving them as ultra-high resolution digital data, which can then be used as a reference for later restoration and reconstruction work.

## New Ways of Appreciating Art in Museums of the Future

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- **Experience-Based Aerial Image Content**

Ultra-high-resolution data maintains the high quality of images even when projected on large screens. Viewing them at immersive museums, which are growing in popularity, can create new and captivating visual experiences.

- **Deployment in XR Such as VR and MR**

MoCoSS can be utilized in projects to enjoy artwork in new styles with XR such as VR and MR. The ultra-high resolution data makes a wide variety of experiences possible, from being immersed inside artwork to viewing pieces from any angle.

- **Interacting with Art**

Ultra-high resolution data can be output to a 3D printer to create ultra-high definition replicas. This can be used as supplementary materials in museums, teaching materials in workshops, and for traveling exhibits in educational settings.

## Creating New Value for Collections

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The ultra-high definition, unparalleled accuracy of digital data provided by MoCoSS can be used for enriching digital content experiences to create new value for collection items.

