

All About 3D Data Capture

Using the DPI-8 to Digitally Capture *Sunkaraku* in 3D

Gregory B. Lawes, Julie Schmitt, point3D

May 3, 2015



“Sunkaraku” evanescent

[ev-uh-nes-uh nt]

adjective

1. vanishing; fading away; fleeting.

Sunkaraku in 3D

First preserved by the Philadelphia Museum of Art through acquisition in 1928, the Japanese Ceremonial Teahouse known as Sunkaraku, has now been preserved in 3D by point3D using a DotProduct DPI-8 Imager. The ceremonial teahouse was built in about 1917 by the architect Ōgi Rodō, the grandmaster of Sukiya architecture, and is typical of traditional Japanese teahouses. This particular teahouse takes its name from the wooden signboard under the eaves of the tearoom itself, which reads Sunkaraku (*sunkaraku* or "fleeting joys"). The tea ceremony, for which the structure and garden is built, is performed today as it has been for centuries, as a ritual of serving and drinking.

point3D

All About 3D Data Capture

The architecture of this teahouse reveals both a delight in, and reverence for nature in the choice of materials: cedar thatch for the roof, branches from nandina and red pine trees with the bark intact for the pillars, bamboo stalks for the ceiling and rainspouts, and earth colored plaster for the walls. Digitally capturing both the physical and spiritual aspect of the structures in a scan is challenging, but with the aid of color and ability to peer within, we have set out to capture the spirit of the teahouse.



For the point3D team capturing the teahouse, the experience, too, was a fleeting joy. We are usually involved in educating users on how best to shoot piping in a nuclear plant, or how to scan a commercial space for renovation, or the best way to capture a ship compartment for a ship refit. So, when the opportunity presented itself, we jumped at the chance, knowing that opportunities like this can be “fleeting.”

The teahouse installation includes two separate but connected structures, the waiting room and the tearoom, placed in a garden that was planned by one of Japan's foremost contemporary garden designers, Matsunosuke Tatsui. The overall size of the area, the garden setting and the historic and cultural sensitivity of Sunkaraku presented a challenge to capture. Further complicating the capture were the students of Asian arts and visitors to the museum wandering through the gallery space. This was a challenge the DPI-8 Imager and point3D team were able to easily handle.

point3D

All About 3D Data Capture

We approached the size challenge by capturing the overall scene with overlapping scans. Each structure was also captured in overlapping segments. The trick here was to make sure the segments for each structure had sufficient overlap, and the segments themselves overlapped sufficiently to allow good alignment. By capturing in segments we could also work around the interested visitors.



Being a culturally sensitive space, we were not able to capture everything. With a carefully raked sand garden, and exhibition rope barriers, there were limits to access. The interiors were captured to the extent that we could peer over and in, and scan. The DPI-8 was handed to the tallest member of the team to capture what could be seen of the roof. While what was captured of the roof may be described as a fleeting glimpse, there is enough to recreate in 3D.

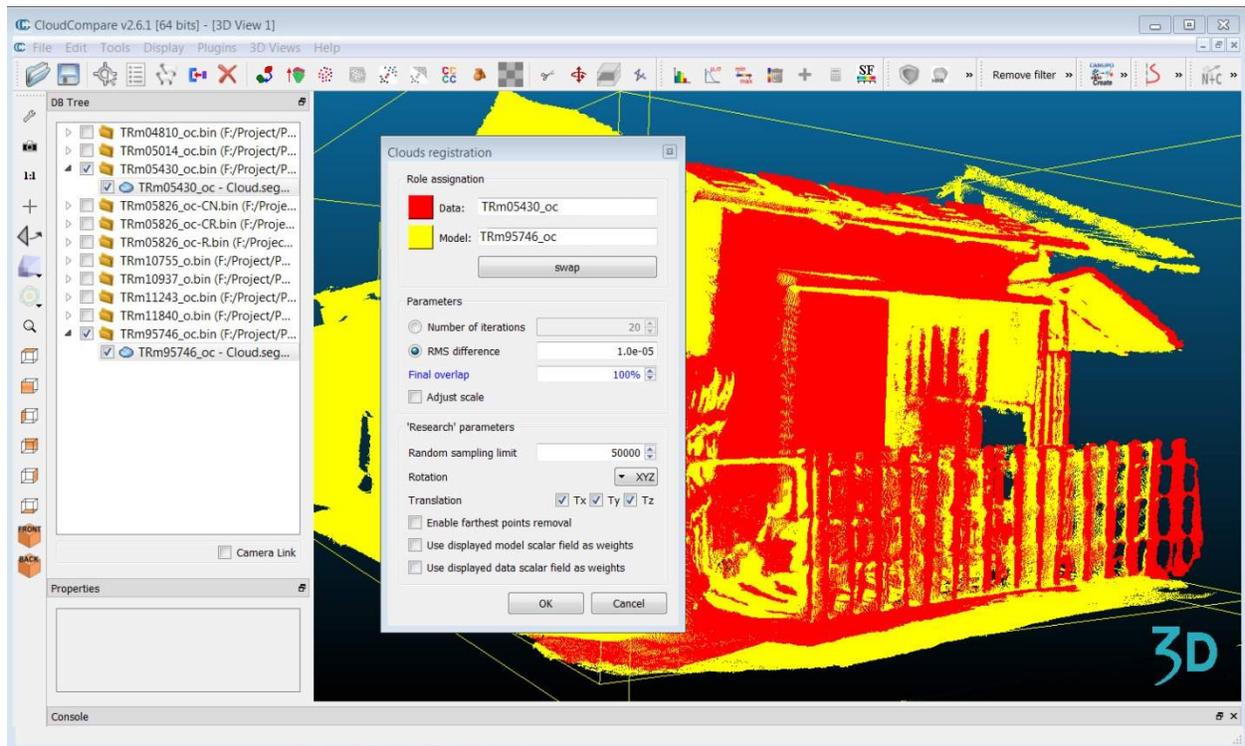
The method for assembling segments to produce the overall scene had to be given careful thought prior to starting scanning. For instance, we planned to utilize the DotProduct Phi.3D Coordinate System Axis Alignment and Coordinate Assignment functions, so it was imperative to capture proper geometry in key scenes.

The Phi.3D COORDS functions allow a user to define a coordinate frame that can be used for measurements and export. We used the Align Axes function to define axis orientation relative to surfaces in the scene. In one scan, the interior floor defined the Z axis while an interior wall defined the X axis. We used the Set Origin and Set Coordinate functions which allowed us to position the scans at their approximate correct position in model space. After defining the axis orientation and origin of each scan on the tablet, we transferred the DP scan files to the laptop for the final processing.

point3D

All About 3D Data Capture

The next step was to refine the location and orientation of each scan to accurately align and create a composite scene. We utilized the CloudCompare application, starting with the Translate/Rotate function. Once all clouds were roughly aligned, we used the Segment function to crop noise or un-necessary data, such as adjacent facility walls, from the scans. The final step was to utilize the Fine Registration (Iterative Closest Point) function to precisely align scan pairs together.



In addition to preserving Sunkaraku in 3D for study and prosperity, the capture was also used to help announce new point-cloud support to be implemented in Vectorworks 2016. The final registered point cloud was shown at the VectorWorks Design Summit evening event at the Philadelphia Museum of Art, and will be featured in upcoming presentations.

point3D

All About 3D Data Capture

Images

Image 1: Render image of DP laser scan composite point model. Image courtesy of point3D.

Image 2: Picture of Sunkaraku Tea House in exhibition space. Image copyrighted by the Philadelphia Museum of Art and provide courtesy of www.philamuseum.org.

Image 3: Screen image of DP laser scan composite point model. Image courtesy of point3D.

Image 4: Screen image of DP laser scans during CloudCompare registration process. Image courtesy of point3D.

point3D

All About 3D Data Capture

Credits

About the Philadelphia Museum of Art

The Museum began as a legacy of the great Centennial Exhibition of 1876, held in Fairmount Park. At the conclusion of the celebrations Memorial Hall remained open as a Museum of Art and Industry "for the improvement and enjoyment of the people of the Commonwealth". Asian art objects acquired from the Centennial Exhibition were prominent in the galleries of the Museum's first home when it opened in 1877. Today the Museum's collections include paintings, sculpture, ceramics, lacquers, metalworks, and textiles from all of Asia. Through its history, the Museum has seen carefully planned growth and expansion of both art and facilities, transitioning into the new millennium as a leader of the art and community. For more information, www.philamuseum.org/.

About point3D

3D Data Capture expertise, laser scanning solutions, and real-world project experience are the reasons people call on point3D. Our team of industry veterans and technical experts provides 3D reality capture consulting and services, work process training, and best-in-class product resources. point3D services both the user community (owners, construction managers, engineering companies, etc.) as well as service providers and survey companies. We offer cutting-edge laser scanning tools, including the DPI-8 hand-held device for capturing color point clouds in real-time. For more information, visit www.point3d.us.com.

About Vectorworks

Nemetschek Vectorworks, Inc. is the developer of Vectorworks software, a line of industry-specific CAD and BIM solutions that allow designers to easily capture, develop and communicate their ideas with accuracy and efficiency. With more than half a million users around the world, Vectorworks software is a global leader in 3D design technologies for the AEC, landscape and entertainment industries. Nemetschek Vectorworks was founded in 1985 and has been a part of The Nemetschek Group since its acquisition in 2000. For more information, visit www.vectorworks.net.