

## **Restoration of Relics with 3D Digital Data**

- Digital Measurement and Restoration of Buddhist Image by Touchable 3D Modeling System -

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As many relics excavated from the sites are damaged, it is necessary to restore them for their conservation and exhibit. Although the skilled technicians conduct the restoration work, there is still much possibility of damaging relics. By the progress of a recent computer technology, it has become able to measure the precise 3-D shapes of relics and restore damaged portions of relics without actual physical touch on them.

In this research, a touchable 3-D modeling system called FreeForm was paid attention to as the restoration software. In restoring 3-D digital models, we can feel touched force on an object and restore it with a pen type device.

The process of the restoration system is composed of measuring the 3-D object shape by an optical 3-D measuring machine called ATOS, restoring damaged portions by FreeForm, and making the restored object by a resin molding machine called Dimension. By using this system, we restored a Buddhist image of Ryukoku University excavated by the Otani exploration.

We conducted the restoration work with computer by the process similar to the traditional physical method. As the result, we restored the Buddhist image well to detailed shape by the 3D modeling software FreeForm while feeling the sense of physical touch. It becomes clear that FreeForm operated in the analog is suitable for the restoration of the object with the free curved surface like the Buddhist image. By improving this method, it becomes possible to conduct more efficient and precise restoration, which leads to less possibility of damaging the relics after excavation.