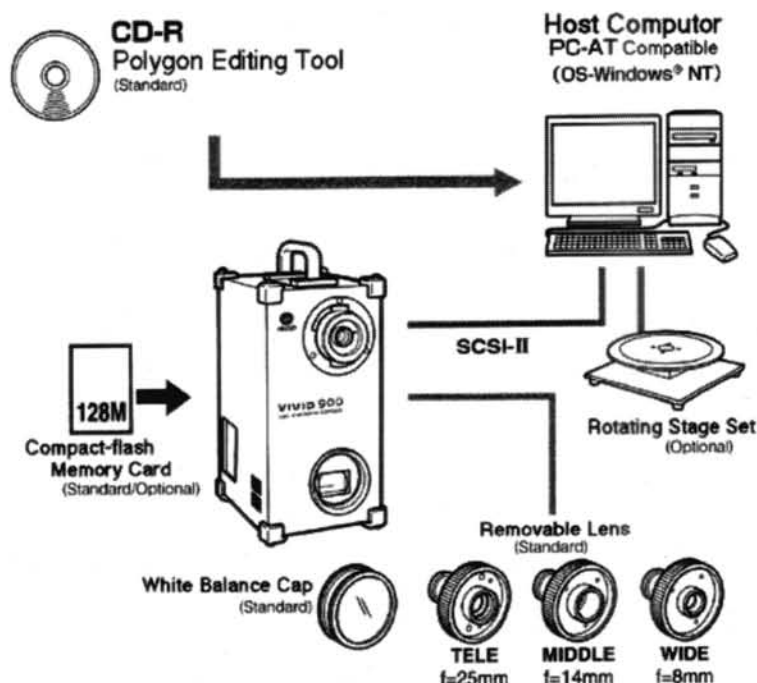


3D Shape Measurement as an IT tool at the Angkor Monuments

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The application of Information

Technology is rapidly progressing in the field of cultural heritage. In Sophia University Angkor International Mission, 3-dimensional digital measurement survey, such as digital imaged Buddha statues unearthed from Banteay Kdei temple, have been tried in past 2 years. Although there was still a problem with developing technology, highly precise 3-dimensional form data which can be used as research basis was easily obtained. In this presentation, the author would like to report the actual aspect of practical use of such measurement apparatus. Also, actual 3D measurement survey will be demonstrated after the presentation. Non-contact 3D digitizer and personal computer. Usually, digitizer is defined as device for converting analogue

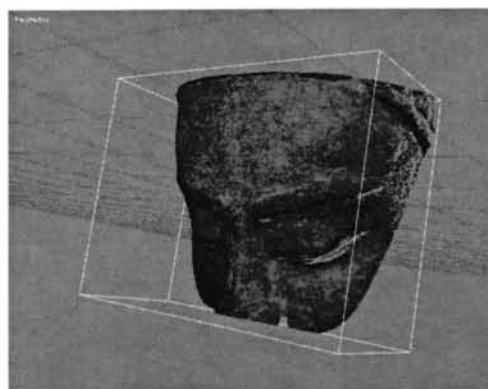
signals into digital signals (analog-digital converter, analog-to-digital converter). Therefore in wide meaning, input devices of computer like pen-tablet, track ball or mouse are included in the category of digitizer and it must touch directly to the object for converting analog data to digital data. Although, differ from usual (contact) digitizer; non-contact 3D digitizer that we chose for this project dose not need to contact the object for measurement. Its cans the surface of object by laser beam.

Originally, non-contact 3D digitizer has been developed for engineering and part replication. The system can enter geometries into CAD systems for designing parts, molding, and tooling for automotive and aerospace industries, appliances and industrial equipment. It also may be used in dental applications to model teeth, bones, and other body parts, as well as in areas such as archeology to reproduce and study fossils and relics. The system can digitize geometrically complex parts that would take too long to model from scratch, or those too flexible, fragile, or in poor condition.

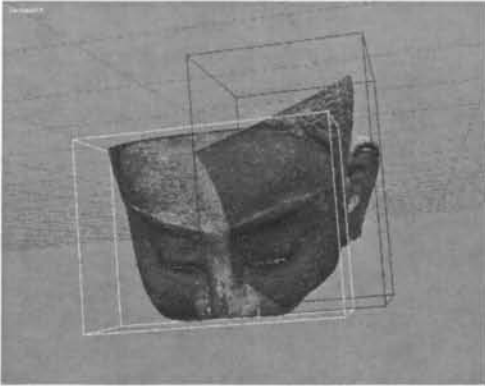
Taking 3D images

In one measurement, in this case, an average of 20-30 images from various angle were taken for one Buddha head. These pictures are automatically compounded with image-processing software, and 3D picture is created.

In other words, the 3D pictures from above and down etc. are stuck and image will be created. If the picture of 30 shots is compounded, the cycle of



Step 1: front image



Step 2: front image from different angle



Step n: final image

taking – compounding 3D image will be repeated 30 times.

During this project, we have a few problems in laboratory works. Non-contact 3D digitizer has been developed for indoor engineering and not designed for outdoor use. Among of those troubles, condition of sunlight was most difficult problem to solve. Both intense light and insufficiency of the light, or diffused reflection from the object disturbed laser beam of digitizer and made it impossible to take 3D image. Moreover, complicated structure of the site disabled us to set up artificial light or shade to adjust the light power.

Remarks

Originally, non-contact 3D digitizer has been developed for engineering and part replication. Therefore, we are lacking of practical knowledge for application of this technology into the field of cultural heritage. Although practical use of 3-dimensional measurement have some difficulty, it can carry out comparatively easily and various researches may be enable based on the data. Moreover, when there was such data, it also turns out so-called digital museum and it is likely to become far attractive.