In 1925, the German-American Professor Hermann Vollrath Hilprecht (1859 - 1925) donated his collection of ancient oriental artefacts to the Friedrich Schiller University of Jena, Germany. The professor from Saxony-Anhalt, who took part in numerous excavations, for example in the city of Nippur, one of the most significant cities of ancient Mesopotamia, did so in memory of his late wife who passed away in Jena in 1902.

Hilprecht’s legacy comprises a total of 3300 cuneiform tablets originating from Mesopotamia. The most well-known object of this collection is the city map of Nippur, the oldest known map to date, going back to the middle of the 2nd century BC.

Objective and measuring object

For a number of years, members of the Jena Faculty of Ancient Oriental Studies have been documenting the numerous cuneiform tablets through their respective three-dimensional scans using a breuckmann Scanner of the Max Planck Institute for the History of Science in Berlin.

The objective over the coming years is to make these treasures of bygone times which to a vast extent date back around 3500 years available on the internet for scientific studies. The platform used to do so is the Cuneiform Digital Library Initiative, a joint venture between the Max Planck Institute for the History of Science and the University of California at Los Angeles (UCLA), under the management of Robert K. Englund (L.A.) and Peter Damerow (Berlin).

Due to their age and history, the discovered tablets are often damaged and difficult to decipher. When performing a transliteration, scientists of ancient oriental studies therefore often try to achieve a better legibility of the tablets by applying varying illumination angles. Two-dimensional scans even at very high resolution are often not sufficient to do so due to the fact that they have been captured by using uniform illumination.

By contrast, special software for three-dimensional objects allows for one or more lights in the viewer and also to alter the camera position. This way, the working procedure of the ancient oriental studies scientist can be simulated virtually, without the researcher having to hold the object in his hand or even having to travel to its actual location.

Using the help of an adjusted virtual working environment can thus perfectly simulate the working method of the scientist, allows for a higher productivity and — once a sufficient amount of three-dimensional tables is made available — provides the possibility of a platform to compare different tablets and their respective properties.
Measuring system and setup

In order to perform the highly precise and yet fast digitization of the cuneiform script tablets, the ancient oriental studies scientists in Jena are using the smartSCAN-HE of the Max Planck Institute for the History of Science. Thanks to its modular configuration using black-and-white or color cameras in varying resolutions and settings, the smartSCAN-HE scanning system which is operating on the basis of the white-light fringe projection technique, can be swiftly and precisely adjusted to any specific client or project requirements.

Workflow

The ancient oriental studies scientists in Jena are working with the smartSCAN-HE fitted with two 5 megapixel color cameras at a measuring field of 100 x 75 mm. Allowing individual scans to be aligned fully automatically, the system is operated in combination with a turntable. A cuneiform script tablet positioned flat on the turntable is captured with six scanning recordings each of its front and back sides; these captures are then complimented by two additional scans of the tablet's front and back sides at a head-on sensor direction. Provided the tablets are reasonably well preserved, these 14 scans and a time frame of 20 minutes are sufficient to generate a complete 3D data set. Following the completion of a subsequent post-processing process in which the individual scans are being 'cleaned' and merged into a complete polygon mesh, the cuneiform script tablets are then exported for further processing in the standard formats STL, PLY or VRML.

Conclusion

Using the contact-free 3D metrology technique of the breuckmann Scanner, the cuneiform script tablets are easily and swiftly captured at a very high level of precision. The generated data sets can be made available in a very clear and illustrative way to a broad circle of scientists for comprehensive studies and interpretations.

Professor Dr. Krebernik of the Faculty of Ancient Oriental Studies in Jena points out the very diverse requirements of this type of work: “The clay tablets are characterized by a pronounced spatial structure, many of them are inscribed on both sides or exist in individual fragments.” Thanks to the possibility of 3D imaging, all these aspects and features can be represented and archived in the form of 3D scans. “Afterwards, the generated 3D data can even be used as basis to create true to detail replica casts of the scanned objects“, Prof. Dr. Krebernik explains further.

Literature


Contact / Link

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