

# Towards the automation and objectivity of 3D scanning

Maciej Karaszewski, Robert Sitnik, Eryk Bunsch\*

Warsaw University of Technology, Faculty of Mechatronics, Sw. A. Boboli 8 Street, 02-525 Warsaw

\*Museum Palace Wilanow, 10/16 Koszki Potockiego, 02-958 Warsaw

[m.karaszewski@mchtr.pw.edu.pl](mailto:m.karaszewski@mchtr.pw.edu.pl)

The 3D scanning, a technique of objects' shape digitization, is recently gaining more and more applications. At first used solely for entertainment and multimedia purposes, nowadays is more and more often perceived as a tool for professional documentation. With resolution and accuracy of modern scanners, it can be even considered as a tool for determination of objects' authenticity. However, for this purposes, the digitization process has to be completely objective, without any operator's influence, both in the measurement and in the processing stages. For this, the whole process of obtaining 3D digital models has to be completely automated. During last few years, this subject gained some attention among the researchers, but not many systems realizing this task have been developed. The main reason is the complexity of the problem - not only a way to position the scanning head around an object has to be developed, but also a number of algorithms for various purposes. Those purposes include identification of the poses of scanning head during measurements (so called Next Best Views or NBVs), calibration of relations between coordinate systems of used devices, initial and precise data integration, noise removal etc.

We present a complete system aimed at fully automated digitization (with specified resolution) of various cultural heritage objects, as long as they fit into its working volume and their surface is not reflective. No operator assistance is needed apart from fixing the object to the system and describing its rough dimensions (by definition of radius and height of cylinder circumscribed of an object). The system automatically localizes object's surface and digitizes it until complete 3D model is finished.

The presented system contains devices for collision-free measurement head positioning, algorithms for NBVs calculations, directional measurements preprocessing, noise removal, initial and final integration. This solution (Figure 1) is used inter alia for digitization of Palace at Wilanow collection with spatial resolution up to 10000 points per square millimeter (using structural light 3DMADMAC scanner). Till now, more than one hundred objects have been digitized, mostly biscuit statuettes (Figure 2).

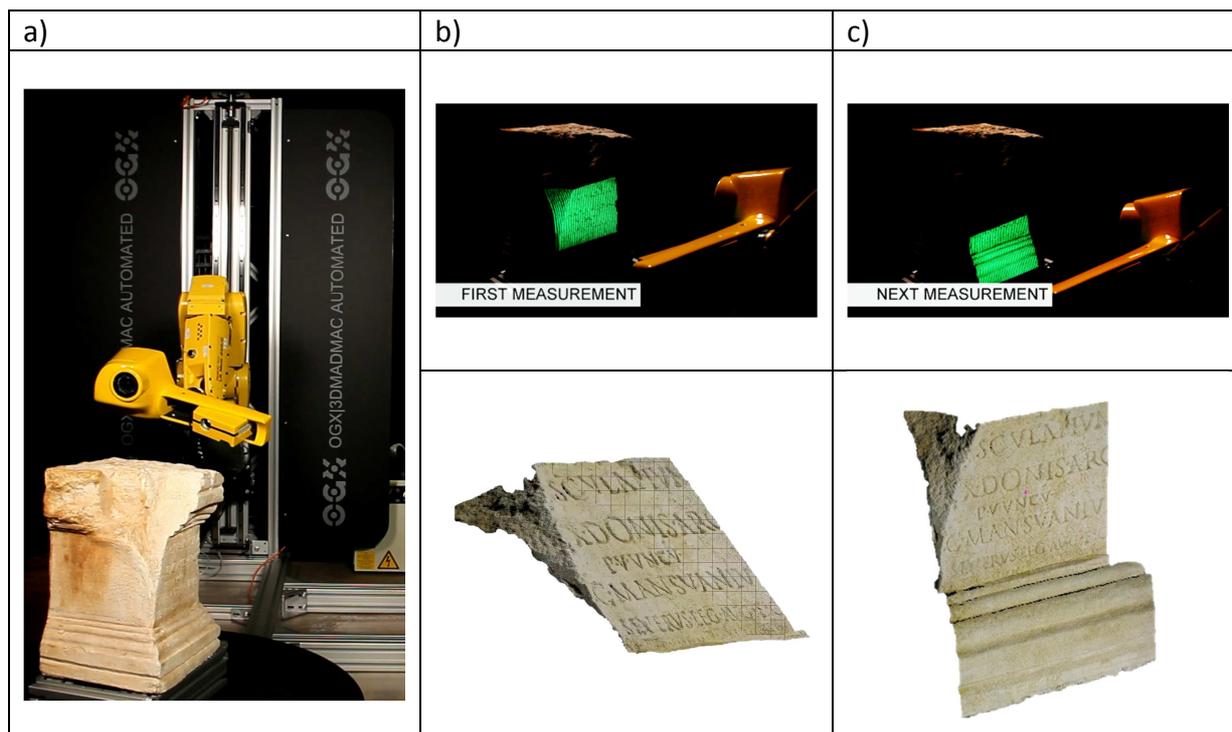


Figure 1. Automated digitization system: a) real setup with object, b) first measurement and its result, c) next measurement and its result.

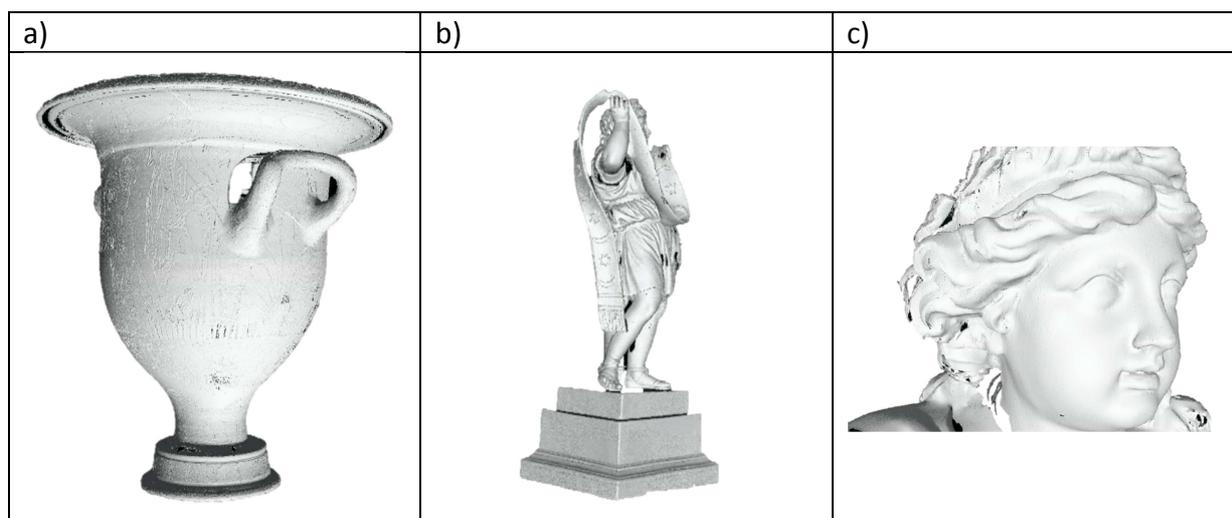


Figure 2. Exemplary digitization results: a) Greek vase, b, c) biscuit statuette.