

Low Cost Digital Photogrammetric Techniques for the Documentation of Cultural Heritage

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SUMMARY

Geometric recording and documentation are of significant importance for the preservation and protection of cultural heritage and are included to the fundamental targets of UNESCO. The most common method for the detailed recording of complex constructions of cultural monuments, both from past and contemporary history, is the combination of traditional photogrammetric techniques (e.g. stereo-restitution or orthoimage production) with surveying measurements. Their results can be especially satisfying and can even meet the accuracy demands of very large scale restitutions.

Terrestrial scanning techniques constitute an additional powerful new tool for such applications. Yet, such methods demand very cost- and time-consuming procedures, specialized equipment and staff. Contemporary digital photogrammetric techniques can provide speedy and affordable alternative solutions for the geometric documentation, resulting to raster products or 3D models. Even the use of high resolution digital cameras, cheap and easy to use, in combination with simple topographic measurements, in order to achieve just the collection of the necessary data, can secure the documentation of the monument.

When the financial or technical conditions will improve, a detailed geometric restitution can be made. Architectural applications like the compilation of façade plans of buildings, fortifications or other monuments which are consisted from almost flat surfaces, can be processed by using simple techniques, e.g. photogrammetric rectification, that can well meet users' needs. Documentation of complex historic buildings can be processed using specialized software for close-range applications; these are based on multiple photography of the building, and bundle adjustment methods of monoscopic measurements of characteristic points. Thus, without any need for control points, with low-cost and quick image acquisition, and with software that does not require specialization in photogrammetric knowledge and equipment, the surfaces of the monument can be reproduced.

This paper gives two application examples of low-cost techniques for the geometric recording of cultural heritage: • Production of orthoimages of facades of buildings at the historic center of Athens. Simple rectification procedures using either control points or only measured distances were applied.

With the appropriate image processing, mosaicing and the addition of vector information, the results were impressive for the needs of the architectural work. • Production of 3D model and façade plans of a Byzantine church (size of 12x10m², two domes and multi-level roofs). Using a digital camera, multi-photos were taken on the ground level and from above. Data processing was made using PhotoModel software, a simple but powerful tool. The results were compared, regarding accuracy, production time and cost with the corresponding ones from conventional photogrammetric extraction of DSMs and orthoimages.

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