

# Close-Range Photogrammetry as a Reference Method for Making Detailed All-Level Excavation Plans

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## Abstract

© 2020 Kazan Federal University. All rights reserved. One of the major problems that archaeology faces today is that the traditional (“manual”) methods of archaeological field data classification and archiving fail to meet the modern requirements in the context of accuracy and convenience. In this study, we assessed the utility of standard photogrammetry for creating excavation plans, as well as developed and tested new methods. All works were performed at the excavation sites of Bolghar, an ancient town in Tatarstan (Russia). The excavations varied in size and depth. The standard methods were found to often yield improper results for the following reasons: the common methods used for obtaining images and processing photo scenes are unsuitable for producing three-dimensional models of archaeological objects without information loss or distortions; photo shooting appears rather haphazard in many cases. Three new photogrammetric methods were proposed: perspective route photo shooting; the method of fixed angles; suborthogonal photo shooting around the perimeter. The effectiveness of the new methods was assessed. Recommendations on their use were given. Based on the results of the study, we concluded that various photogrammetric methods are required to produce highly accurate plans of excavations with different dimensions and shapes. In order to obtain the best result, integration of these methods is required in many cases. Close-range photogrammetry may come in useful if high-precision geodetic equipment is unavailable. Orthophotomaps are less precise than GNSS-based plans, but much more accurate than manual sketches. The results obtained during this study are important for the development of field archaeology. The recommendations given in this paper can be used by archaeologists in their daily work. Compliance with these recommendations guarantees high-precision excavation plans. It is expected that the proposed methodology will become the basis for instructions on arrangement of archaeological excavations in the very near future.

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## Keywords

Bolghar, Close-range photogrammetry, Excavation site, Method, Methodology, Terrestrial photogrammetry

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