Abstract

In this paper, an industrial application of CAD is presented, which concerns the measurement and re-engineering of the shape of a complete ship hull and of ship's parts, which is a frequently recurring task in the shipbuilding and ship repair sector. In order to choose the most appropriate measurement method, several typical aspects of our object of measurement, such as its size, possible obstructions and poor accessibility, have to be taken into consideration, and we concluded that photogrammetry would be the most flexible method. One of the considerations in this respect was that with photogrammetry not only the 3D geometry can be measured, but that also topological properties will implicitly be taken into account, thanks to the fact that a human is interpreting and processing the photos. So a re-engineering system was developed, which consists of two major parts: the shape processing software and the photogrammetric measurement, which are tightly coupled. This system has proved to work fine for large-scale 3D objects, however, additionally, from the ship repair practice the question arose for the measurement of flat construction elements. For this purpose, an alternative and much simpler system was developed, strictly aimed at the measurement and further processing of flat steel parts.

For both methods, the practical applications and best practices are presented and discussed, and a tentative economical evaluation has been composed which shows that the proposed method is cost-effective. Finally, the general conclusion is drawn that the proposed photogrammetry-based system is quite versatile and applicable, although there are also points of concern or attention, such as the required space around the object, the aspect of sufficient light and visibility, camera calibration and the required skills of the users. The proposed method could benefit from further research in areas such as the optimal placement of a minimum number of landmarks and integration of laser-sensing and photogrammetry.