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THE ROLE OF GEOMATICS IN CULTURAL HERITAGE CONSERVATION

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ABSTRACT. *The major aim of this paper is to present a non-destructive method for the cultural heritage assesment. The proposed methodology is based on the combination of topographic surveys, digital photogrammetry and image processing techniques by means of four control points and photographies of the target , that become metric rectified image at any plane defined by the user. There are many reasons and motives for digital modelling of real world objects, including: virtual reconstruction of historical artifacts icons and buildings that no longer or only partially exist, digital documentation for restoration purposes in case of fire, flood, etc.; ability for virtual interaction without the risk of damage; production of e-learning data for educational resources; virtual tourism; virtual museum exhibits; and interactive visualisation of the objects.*

Keyword: *cultural heritage; digital documentation; three-dimensional model; Râmeţ Monastery.*

Aims and background

The modern geomatics survey methods allow to document and represent the territory and architecture with impressive results both from the geometrical point of view and from the final output. Each historical monument represents a page in the history of a location, region, or nation, and they keep alive events and memories throughout the years. The cultural and social importance of the monuments represents a great value for the heritage of a region and can create considerable potential for regional and tourism development. The restoration of historical monuments may improve the development potential, but at the same time, failure of restoration may destroy any development project for that region. The three-dimensional modelling greatly helps to create a restoration project and increases the chances for a correct and long-lasting restoration.

In order to highlight the stages of the three-dimensional modelling as explicitly possible and to use a more practical approach, the Ramet Monastery was chosen as an object of analysis and application. More specifically, the study will focus on the old church within the monastery, which was built in the 13th century and has not benefited so far of any complex restoration project, being initiated only local interventions of minor importance.

Stages in implementation of the project

Creating the three-dimensional model involves going over four essential elements, mainly the land surveying, the preparation of the situation plan, the retrieval of images and the proper elaboration of the model. The elements of data preparation are the key to success regarding a three-dimensional model carried out properly and efficiently implemented. Thus, the actual realisation of the three-dimensional model can be considered the easiest part of this chain.

The land surveying operation had materialised by linking the complete polygonation with radiation (fig. 1).

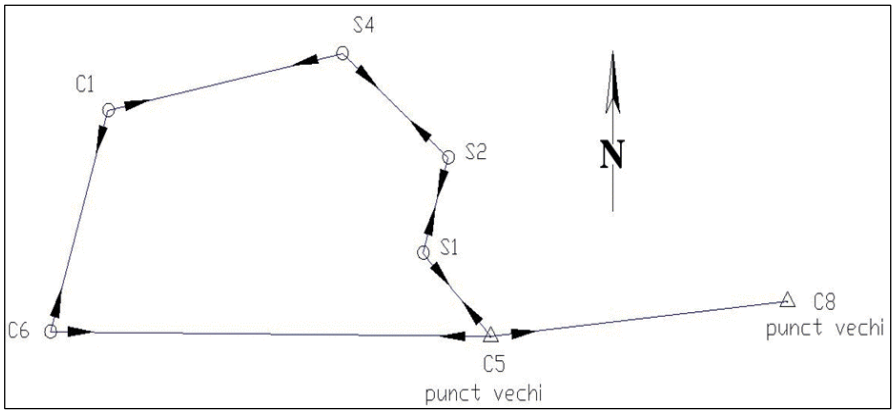

Fig. 1. Traverse sketch

The cartographic material has been completed with the help of the package with CAD functions, the purpose of the program (AutoCAD) being to achieve an efficient automation of the data digitisation process, but not before analytically processing the primary data via specialized software (TopoSys) (fig. 2).

Before starting the shooting process, the camera settings are to be performed, the shooting being done around the church at equal distances, and the images captured consecutively must present common elements. During the photo shooting process of the old church, due to natural and anthropogenic obstacles, two of the facades

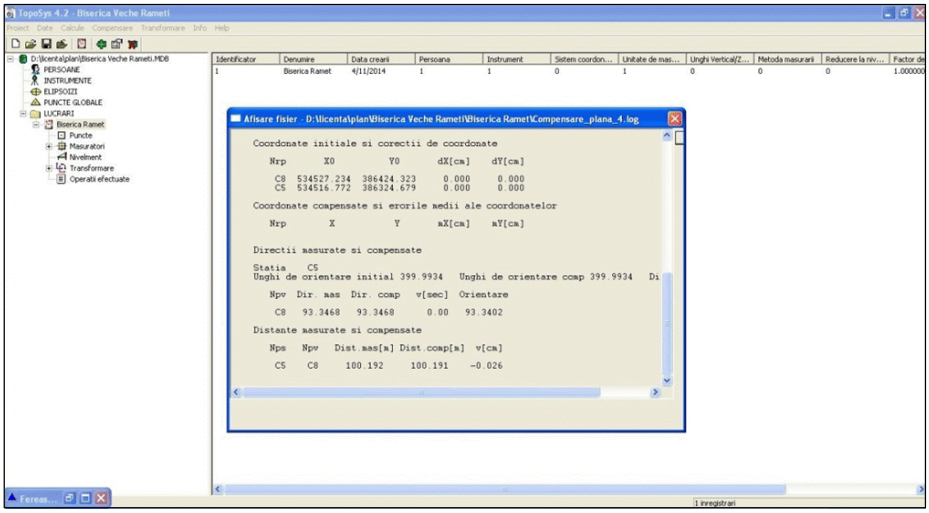

Fig. 2. Calculation of traverse points in the TopoSys program

A great advantage of the AutoCAD application is to substantially reduce routine work in design, speeding up repetitive work and facilitating drawing updates (fig. 3).

The image retrival process, in this case the old Ramet church, is relatively simple. of the church required vertical sectional shooting (fig. 4).

In order to facilitate the realisation of the three-dimensional model, and to improve the functioning of the PhotoModelerScanner program, it has also been used the ArcSoft

Panorama Maker program to create panoramas, that do not require a lot of virtual memory. The modelling involves, in a first phase, the marking of control points on the image, common points highlighted in two or more photographs, and elements that enable referencing and correction of images (fig. 5).

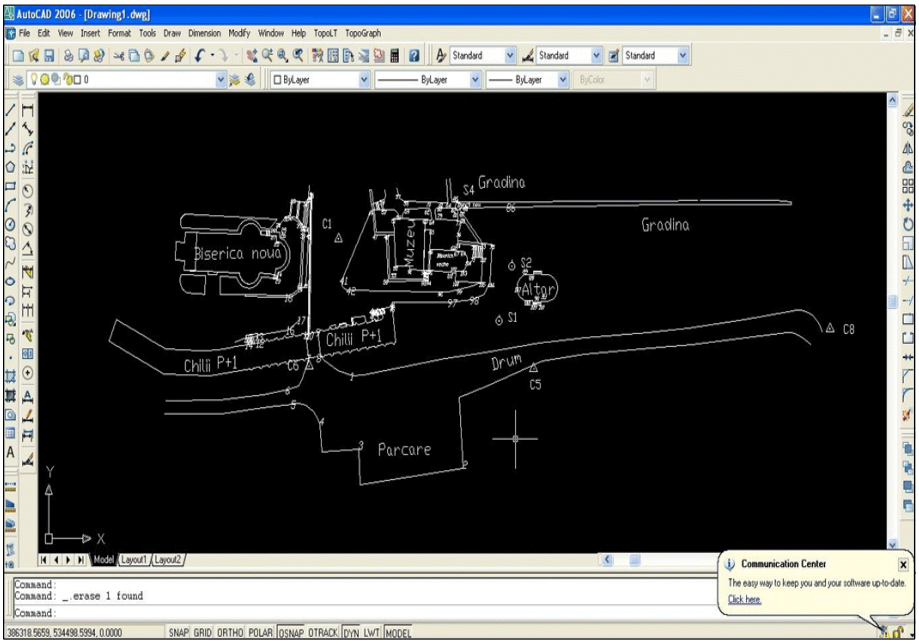

Fig. 3. Obtaining the cartographic map product in a CAD environment

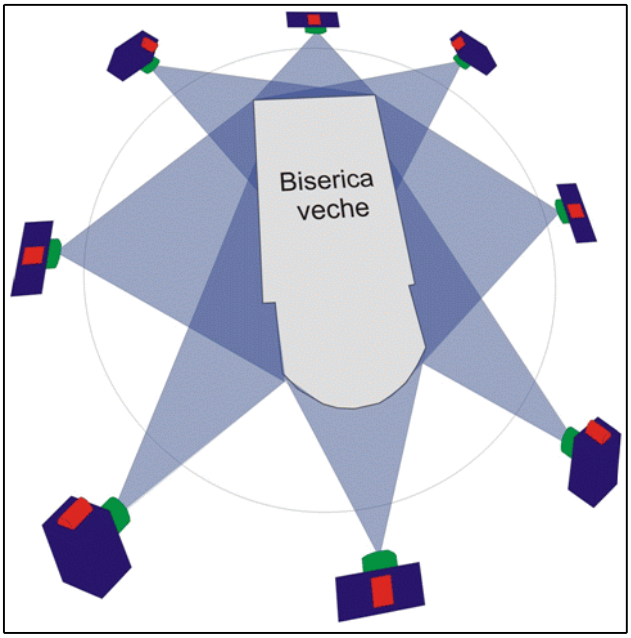

Fig. 4. Image retrival process of the old church

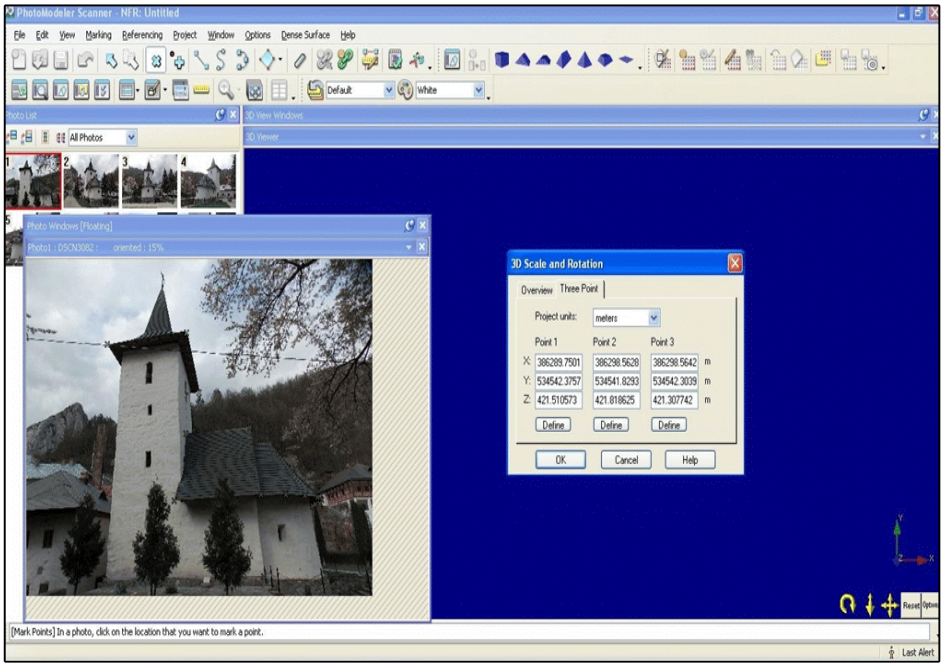

Fig. 5. Assigning the coordinates of referenced control points

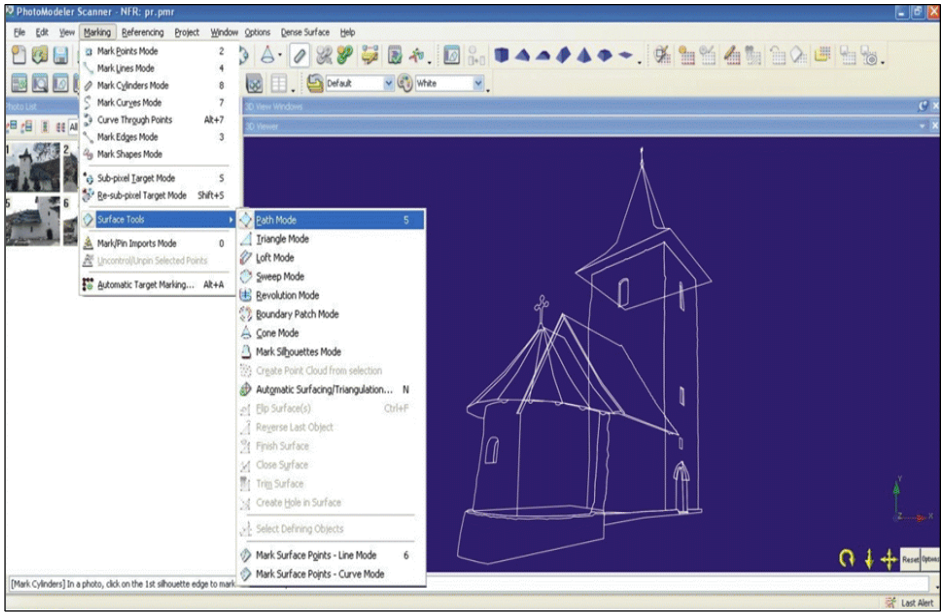

Fig. 6. Premises in texturing geometric entities

By joining the control points, visible geometric figures will be obtained in 3D Viewer mode, the program allowing the filling of geometric entities by simply selecting them (fig. 6, 7).

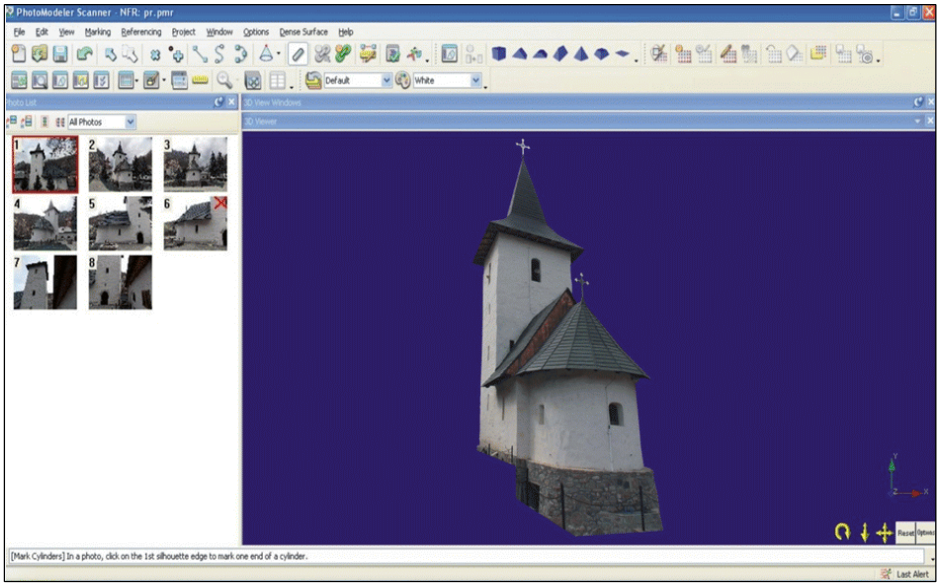

Fig. 7. Viewing the 3D model

Conclusions

The motivation for choosing the old church within the Râmeț Monastery is related to the fact that it has not recently benefited from a complex restoration. Over the years, there have been carried out, of course, maintenance and repair works, but these have only been partial.

The efforts made in the 1990s to save the church, by raising the foundation and the church by 2.08 m have paid off, however, the traces of floods can still be seen today.

At the end of processing the data, the digital models obtained are the basis from which to extract other products, such as orthophotos, 2D vector-based representations, reconstructions, movies, animation. All these outcomes are needed in the field of digital documentation, conservation and restauration, training and research.

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