

## APPLICATION OF THE PHOTOGRAMMETRIC METHOD IN SURVEYING OF THE PALACE AND PARK COMPLEX BUILDING IN MŚCIWOJÓW, POLAND

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### Summary

Nowadays, the photogrammetric methods have become the most popular way of surveying and documenting historic objects. These tasks are very difficult, complex, laborious, and multi-detailed. Often they require hours of work and are sometimes barely visible for the average recipients. Precision, complexity and completeness are the main qualities of such elaborate works.

Ground photogrammetry is based on performing many kinds of tasks and measurements executed on digital photogrammetric photographs. The most important kinds of such elaborations are the digital elaborations of the facades of buildings, allowing the photographs to be processed into a cartometric form. The elaborations have many applications. They can be used, among others things in planning, architecture, various project works, architectural object surveying and building and façade measurements.

### Keywords

photogrammetric survey • terrestrial stereogram

### 1. Introduction

Modern photogrammetry is a rapidly developing field of science. Along with remote sensing, it is not only a source of quantitative data but also qualitative information regarding the studied objects. It provides reliable information on physical objects and their surroundings by the means of recording, measurements and also interpretation of both analog and digital images. The photogrammetric methods provide a comfortable working environment without the necessity of physical contact with the object. The methods and solutions offered by modern photogrammetry have become very useful in many engineering and industrial aspects, including architecture. Photogrammetric measurements are used for the purposes of deformation measurements, 3D modeling or surveying measurements. A photograph is a source of a huge amount of information about an object. Despite possible imperfections, related to e.g. imprecise recording of details, due to the poor state of the surface, it has a large informational potential. It

provides the possibility of performing many measurements, in an incomparably short amount of time. The precision level is an important aspect. Therefore, it should not be surprising, that photographic images have gained the rank of a document and are attached to cadastral documentation in Poland.

The aim of the study was to survey the grange building, which is a part of the palace and park complex in Mściwojów, using the photogrammetric methods. The obtained materials became the basis for a realization of a project. This shows the usefulness and applicability of photogrammetric methods in architectural surveying, using a historic object as an example.

## 2. Own research

### 2.1. Selection and characteristics of the research object

The building selected for the purposes of the study is a part of the palace and park complex in Mściwojów.

Mściwojów is a village located in the south-western part of Poland, in Lower Silesia, district of Jawor (former Świdnik-Jawor Duchy). It borders Wądroże Wielkie and Legnickie Pole on the north, Strzegom on the east and Jawor on the west. The village is located in the central part of the voivodeship, 65 km from Wrocław, 55 km from Jelenia Góra and 25 km from Legnica. There are two national manor roads running through the commune: Szczecin – Jakuszyce (road no. 364) and Jawor – Wrocław (road no. 373) [A. Szydłowska-Szczecińska, no information available].

### 2.2. Source materials and the method of their acquisition

The source material for the photogrammetric study were the analog photographs made using the measurement camera UMK 10/1318. The digital images were obtained by scanning these photographs.

The data for the study was taken from the UMK 10/1318 camera specifications:

$$f = 99.6 \text{ cm}$$

$$b = 8$$

$$DX = 161.219$$

$$DY = 114.970$$

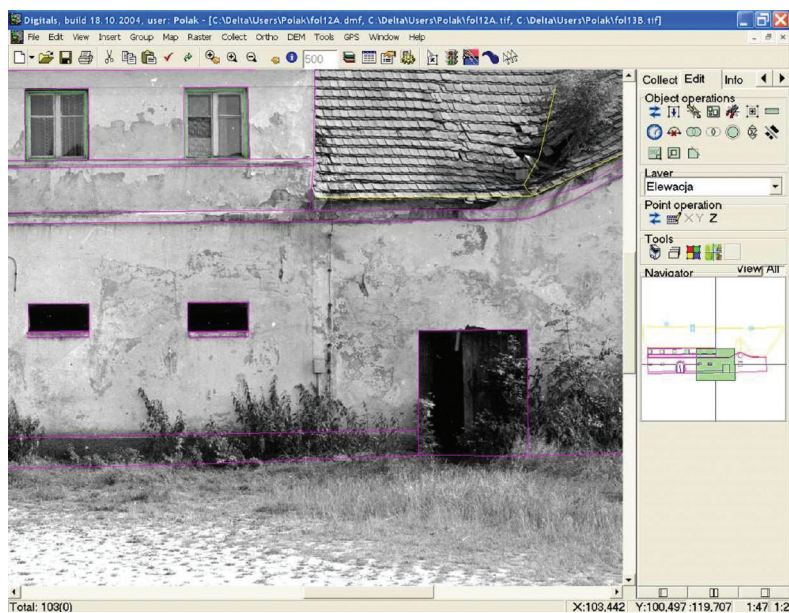
## 3. Results

Based on the acquired materials and information, the grange building was digitized using Delta photogrammetric digital station. The following elaboration shows the capabilities and advantages of digital photogrammetric methods. Based on the performed digitization of the grange building, the information for surveying purposes was acquired. Digitization was performed in an optimal way, in relation



Source: authors' study

Fig. 1. Digitization of the object. Partially covered façade



Source: authors' study

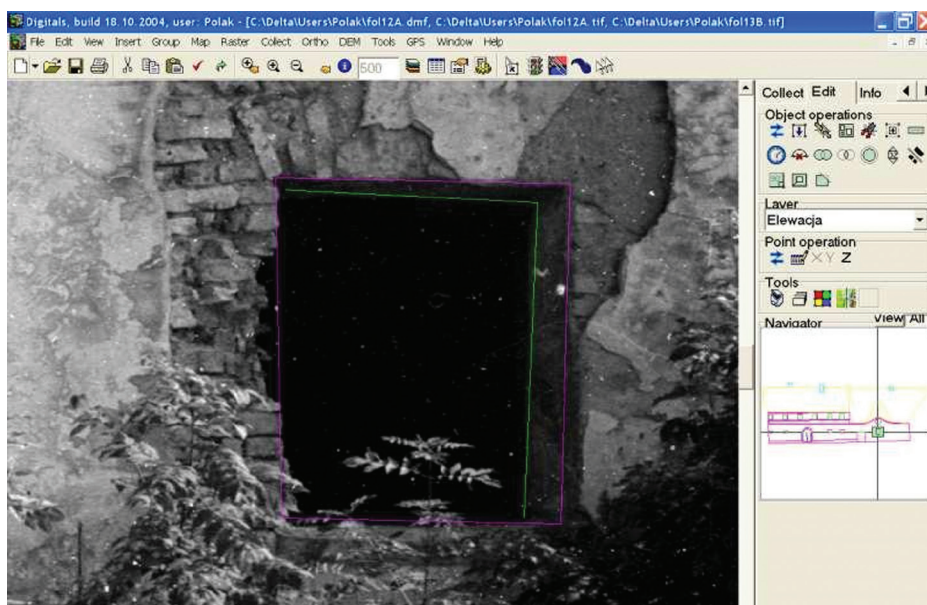
Fig. 2. Digitization of the object. Partially covered façade





Source: authors' study

Fig. 3. Digitization of the object. The roof, dormer and the remains of a chimney



Source: authors' study

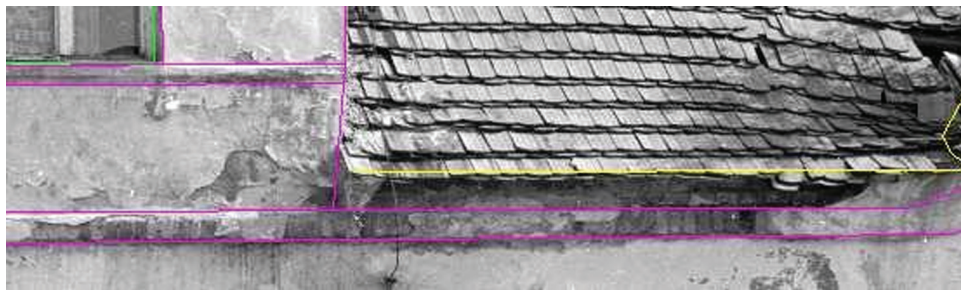
Fig. 4. Digitization of the object. The window

to the possibilities that the stereogram gave us. Some elements were not possible to measure, as they were not visible (the façade was partially covered with the bushes) in Figure 1.

Figures 1 and 2 clearly show the disadvantages of the method. Dense bushes, located on the right hand side of the building, cover a big part of the façade. Another problem encountered is the difficult access to the windows. The last window in the building is almost impossible to measure. Due to obvious reasons, it was omitted in digitization. Difficulties were also experienced in the case of the door, partially covered with bushes.

The next group consists of the elements influenced by the poor condition and repair of the building and the inaccuracy of the images. The right side of the building is in very bad condition. The window, the door, dormer, the roof, and the remains of a chimney are all damaged (Figures 3 and 4).

Serious difficulties were also experienced, due to the defects in the structure of the façade. The age of the building and the lack of any renovation work resulted in chipping of parts of cornices (Figure 5).



Source: authors' study

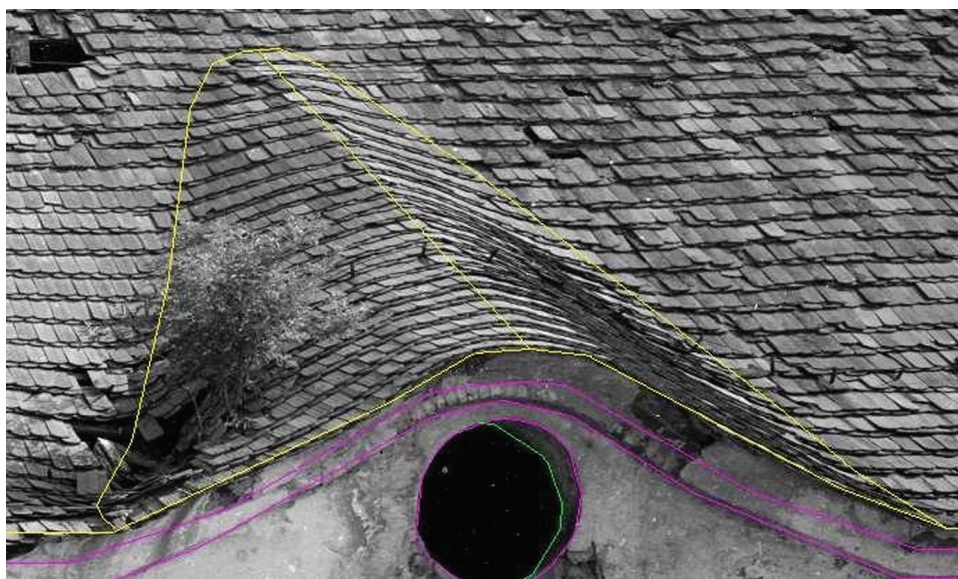
**Fig. 5.** Digitization of the object. Cornices

The remaining part of the façade was photographed in the way that would allow digitization of the object. Each layer contains information specified in its name, using the line properties determined at the start of the project. The "Façade" layer contains the inner parts of the cornices and the outer edges of window and door openings. The windowsills on the lowest level of the building were elaborated externally. The edge of the base of the building was captured where possible (it was partially covered). The inner parts of the window openings are located in the "Windows" layer. In addition, visible in stereo are the edges of the windows and the dormer, similarly in the case of "Doors". The outlines of the chimneys are part of a layer of the same name. The roof was elaborated along the ridge and the visible, most outer edges. The border between the levels of the roof was set along the edge above the 2<sup>nd</sup> floor. The roof pitch was marked above the dormer (Figures 6 and 7).



Source: authors' study

Fig. 6. Digitization of the object. Roof pitch



Source: authors' study

Fig. 7. Digitized grange building in Mściwojów

#### 4. Conclusions

Photogrammetry is a field of science that combines two main areas. It is based on analytical and digital photogrammetry. Digital photogrammetry was shaped by



combining the analytical foundations with the achievements of modern technology. This relatively young yet rapidly developing field of science is getting more and more popular. For the last few years, the photogrammetric methods have been greatly appreciated but not only by surveyors. Photogrammetry's popularity grows, as new applications in the field of technical sciences, such as engineering, architecture, geodesy, or the described surveying measurements are constantly invented. Photogrammetric methods provide an objective and very detailed overview. The images contain a lot of accurate information which is gathered in an incomparably short amount of time. The time aspect is undoubtedly a significant factor for the quality level of the measurements. The measurement of an unlimited number of points can be repeated many times. An additional advantage of this method is, that it allows measurements of points that are impossible to be measured directly. This solves the problem of dangerous sites, connected with measuring (unstable structures, highly placed points), as well as the problem of inaccessible points. Photogrammetric methods reduce the inconvenience of field work to a minimum. The measurements, often time-consuming and weather-dependent can now be done while indoors. Highly developed technology allows us to automate the process of image elaboration.

## References

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