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NATURAL ASHLARS OF HISTORICAL MONUMENT – MODERN METHODS OF DATA PROCESSING AND STORAGE

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Abstract: *The aim of the introduced contribution is to present the methodology for the research and maintenance of facing ashlars of historical structures. The natural building stone of historic monuments is subjected to various types of deterioration and damages mostly due to weathering processes. If the stone has to be completely changed during the reconstruction, it should be preferentially replaced by variety of the same lithological composition, the same or similar appearance and with the sufficient durability. The aim of this paper is to bring a modern look for the processing, visualization and storage of information obtained in mapping facades of historic buildings. The data processing and their storage in GIS were implemented on the façade of St. Martin's Cathedral in Bratislava.*

Keywords: ***Natural ashlars, data processing, GIS, databases, visualization of facades.***

1. Introduction

The natural building stones in historical monuments ashlars undergo to weathering processes and therefore they are damaged. The weathering processes cause physical disintegration and chemical changes having the effect on changes of rock structure and its physical properties. If the stone has to be completely changed during the reconstruction, it should be preferentially replaced by variety of the same lithological composition, the same or similar appearance and with sufficient durability. From that point of view, the deteriorated façade has to be detailed and well researched and mapped. The aim of this paper is to bring a modern look for the processing, visualization and storage of information obtained in mapping facades of historic buildings. Processing and visualization of spatial data is processed within Geographic Information Systems (GIS), where used are not only the tools for vectorization (digitalization) of analog data and visualization modulus, but also advanced tools of map algebra.

2. Processing of ashlars facade plan and data storage results

Preparation of input data and assumptions of technical processing issues

The main instruments, except of external graphics modulus for processing, vectorization, analysis and visualization are Geographic Information Systems environment (GIS) and database systems. The basic requirement placed on the façade plans is their positional accuracy. When processing the façade plans a commercial product by ESRI (Environmental Systems Research Institute) - ArcGIS 9.1, working under the Microsoft Windows had been used. Microsoft Access database in package Microsoft Office 2003 was used for our targets as the database system.

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GIS based processing

Based on detailed photo documentation of historic building within frame of field research, the subsequent generation of facade plans using GIS very useful is. The output of this stage is a detailed and accurate plan of the facade, which has incorporated elements of stone blocks characteristics. The first step is facade mapping and identification of individual ashlars of the object using existing paper plans. The second step is using of photogrammetric approach, to create photo documentation of the object façade, predominantly for bottom part of the objects, which is the most affected by weathering processes. These records should be rectify, georeferenced and digitize using vectorization tools within GIS environment. The third step after the vectorization is visualization of the vectorized parts of facade plans (Fig. 1). We can use the non-spatial data for providing of various analyses using map algebra, e.g. how many and which blocks are damaged due to concrete type of weathering, how many and which ashlars of same lithological type should be replaced, percentually which lithological type is predominantly used on the object and many others.

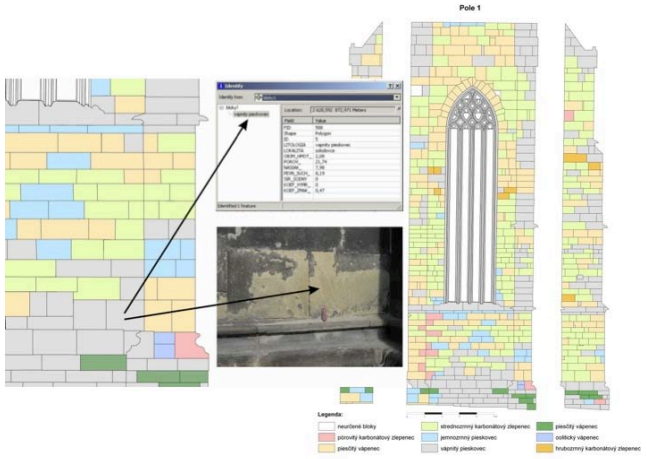

Fig. 1: Processing of part of St. Martin Cathedrale in Bratislava in ArcGIS: right - the visualization represented lithological types; left - a detailed look at one of building blocks, its position in vector polygon format and the information stored in the attribute table (Kovářová et al., 2011).

Database processing

The modern trend of processing information electronically enables to store a large set of data in a relational database in accordance with modern standards of information technology. Microsoft Access database in package Microsoft Office 2003 was used as the database system.

3. Conclusions

The use of the modern approach of façade research and mapping enables to generate a quality façade plan using GIS. This plan provides rich variety of information, especially at the time of reconstruction planning. There are included all the important and useful information about the ashlars material and ornamental façade elements, such as lithological composition, rate of deterioration, weathering forms and as well as the proposal which blocks should by replaced.

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