Cultural Heritage Conservation by GIS

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ABSTRACT

In the recent years, the usage of Geographic Information Systems has been rapidly increasing and it became the main tool for analyzing spatial data in unprecedented number of fields of activities. The integration of GIS, Remote Sensing and modeling technologies applied to the field of Cultural Heritage Conservation can be an important tool for management and decision making. This article will present a study regarding the applicability of GIS in cultural heritage conservation, documentation and promotion in Bihor County Romania

INTRODUCTION

In the recent years, the usage of Geographic Information Systems has been rapidly increasing and it became the main tool for analyzing spatial data in unprecedented number of fields of activities. The newer technologies like Geographic Information System (GIS) greatly facilitated the inventory, evaluation, and preservation of historic sites. Therefore the integration of GIS, Remote Sensing (RS) and modeling technologies applied to the field of cultural heritage became an important tool for management and decision making.

Overlaying and combining information in GIS with considerable analysis and visualization methods can provide an important contribution for the sustainable development of the historic areas. Thereby the survey and analysis of cultural data are playing a special role in the management of historic sites. As a result of the combination of current and historical data valuable hints arise from the procedures in cultural history and can be used for future planning.

Therefore, this paper describes the applicability of GIS in the preservation and promotion of the cultural heritage.

GIS APPLICABILITY IN CULTURAL HERITAGE

Architecture is a substantial part of our cultural heritage. But whereas other elements of our cultural heritage may be protected by putting them in a museum, architectural

monuments are widely used and endangered by long term influences of the environment. Therefore it is necessary to document the actual state of the architectural monuments in a manner, which opens the opportunity to detect continuous damage by using change detection techniques and to restore the monument in case of heavy damage.

An integral process of cultural heritage conservation should at least include:

1) Prospecting for cultural heritage and investigating correspondingly;
2) Evaluation of cultural heritage, including its values, preservation status, potential hazards and so on;
3) Establishing and carrying out reasonable preservation planning;
4) Effective monitoring on cultural heritage and feedback in time.

New technologies like Geographical Informational System, Remote Sensing and 3D modeling can be used and are used in the process of documentation and conservation of cultural architectural monuments.

Geographical Informational System and Remote Sensing have valuable applications to each of the four principal procedures involved in preparing management plans for cultural heritage sites. These procedures are:

- Research: historical and physical site documentation
- Analysis: assessment of physical condition, cultural significance and the social and administrative context
- Response: preparing conservation and management strategies
- Implementation: carrying out, monitoring and evaluating management policies

Three-dimensional models of the architectural monuments help us to understand the spatial objects, even if they are not accessible for us. Using models from existing objects can make it easier for us to understand complex spatial structures and to propose the required interventions over the monuments.

EXPERIENCE

Based on the evaluation of historical monuments in the area of BIHOR county , the University Of Oradea – Faculty of Architecture and Construction initiated multiple projects regarding the documentation, promotion and conservation of historical monuments within the area. The projects were implemented in co-operation with municipalities and other regional authorities in the region of Bihor.

Bihor County has more than 500 classified monuments, but the most vulnerable monuments are those located in rural areas therefore the specialists from the university choose to document and study the wooden churches.

The wooden churches from Bihor are forming a valuable patrimony both at national and at international level. In Romania are still preserved 1200 wooden churches built before

1900, from which 60 of them are located in the Bihor County. Unfortunately the local communities are not aware about the real treasure that they detain. Therefore, today, most of the wooden churches are abandoned, either because the financial cost of the rehabilitation of these churches are higher than the community affords, or in some cases there is a relative lack of interest regarding the condition of the wooden churches. In some other cases, in wealthy communities, sometimes it appeared a tendency towards abandoning the old wooden church, which is a historical monument, in order to build a new bigger church, most of the time without any artistic and cultural value.

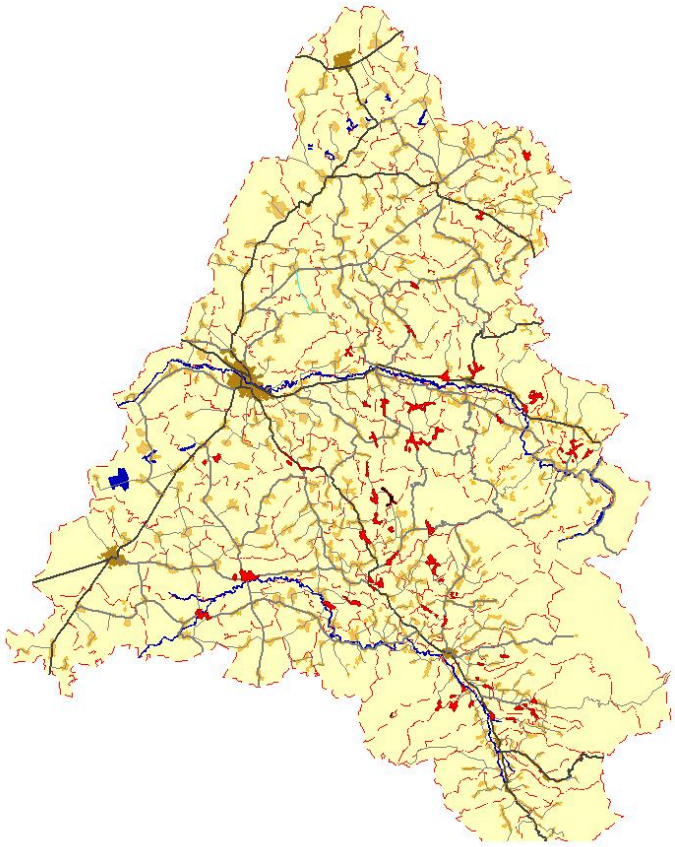


Figure 1- Wooden Churches in Bihor

In the XX-nth century the number of the wooden churches in Bihor County decreased year by year. If in 1931 were 150 wooden churches, in 1970 were 73 and today only 60 wooden remained. In the basin of Cri□ul Repede river 15 wooden churches are declared and classified as monuments.

Documentation, conservation and promotion of historical monuments like the wooden churches are becoming inevitable and it must be done quickly. Therefore the first area studied was the hydrographical basin of Cri□ul Repede river, in the project called: ”Valorificarea Patrimoniului Cultural Popular – Biserici De Lemn In Bihor”, financed by EEA GRANTS.

In order to preserve, to document and to preserve the wooden churches from Bihor County the research team from the University of Oradea and internship students tried to collect valuable data of the history of the region and about the cultural landscape and about architectural monuments from different institutions.

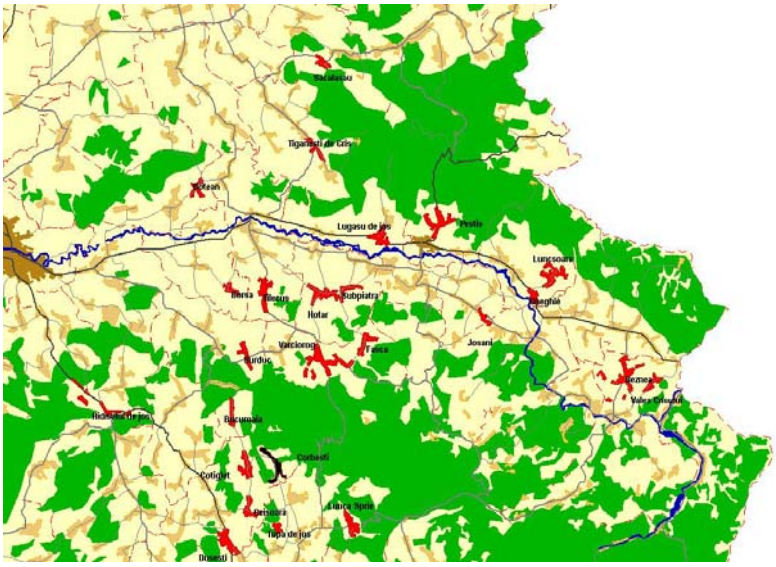
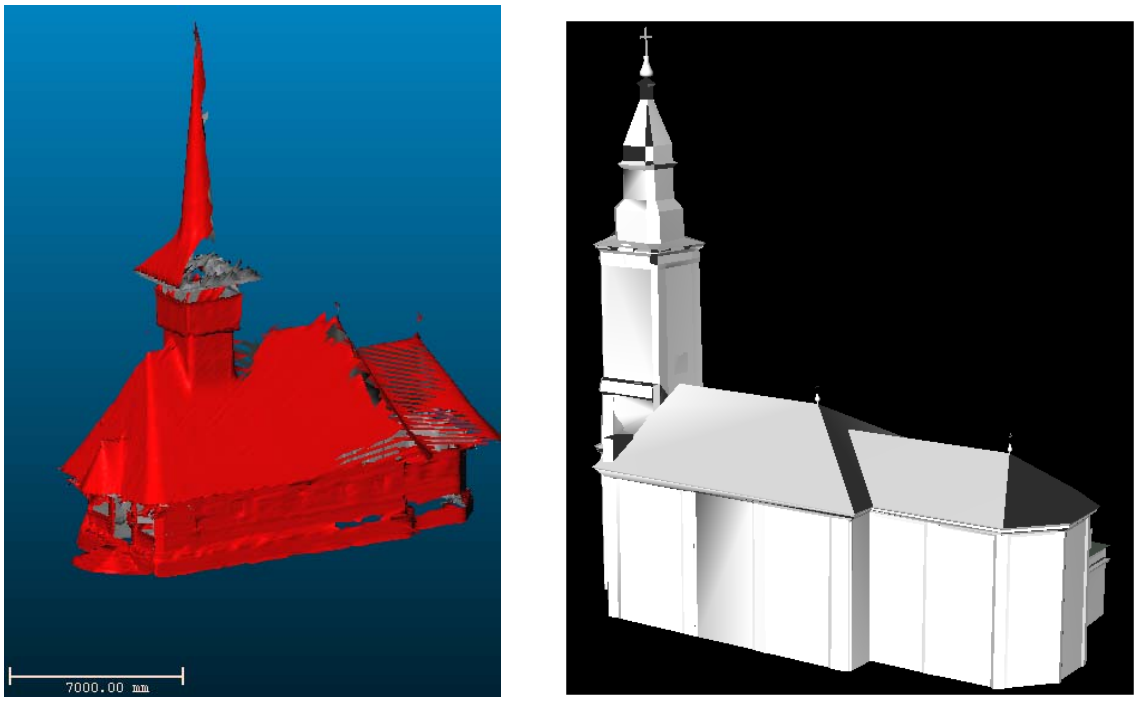


Figure 2 - Wooden Churches in Crişul River Basin

The information collected was:

- Identification of the monument:
  - Topological location,
  - Plan metric sketch of the monument,
  - Documentation through images and inventory of furniture, paintings, so on
  - 3D Model if was possible
- Time evolution of the monument:
  - Historical and archive data about the monuments,
  - Characteristics of the monument: builder, when and where was build, architectural style,
  - Owners
  - Constructive intervention on the monument
- Recommendations regarding further intervention on the monument

There are different techniques in order to realize a 3D model for the cultural heritage monuments. The team researchers from the University of Oradea used two different techniques: Photogrammetric model and laser scan model. In the following images there are presented a 3D model of a new wooden church obtained with laser scan (figure 3a) and in figure 3b, we presented a tridimensional model of the Saint Ladislau church from Oradea.



a) b)

Figure 3 - 3D models

Within this project, for the churches studied it was impossible to use these two methods because of the vegetation and of the buildings which are surrounding the monuments. Therefore the 3D model of the churches was made from the points measured with total station, by using AutoCAD.

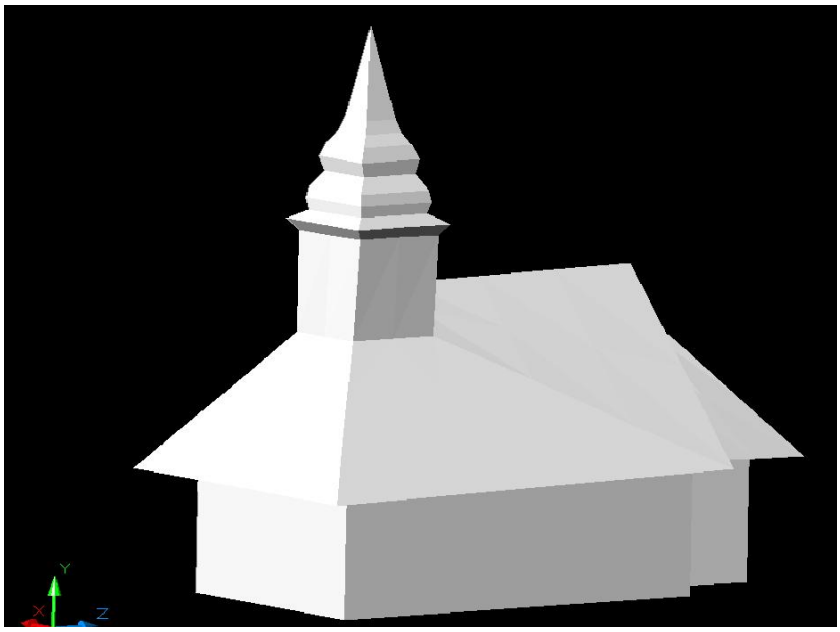


Figure 4 - 3d model for the Hinchiris wooden church

CONCLUSIONS

Usage of GIS for the documentation of the cultural heritage of Bihor County should be useful also for the development of economy and tourism. Beyond that further usage should be considered in preservation of monument and historic buildings, in different planning procedures, in local history and education.

The researchers from the University of Oradea initiated a new project" Promovarea Bisericilor De Lemn Din Ţara Beiuşului Şi Specializarea Resurselor Umane Implicate În Domeniul Conservării Şi Promovării Patrimoniului Cultural, Din Cadrul Comunităţilor Locale" financed by EEA GRANTS to expand the first project to the Beiuş Region. Also the university of Oradea wish to initiate a new project in order to create a 3D GIS map of the monuments in Bihor County.

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