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## DETERMINATION OF BOUNDARIES OF ANCIENT BURIAL PLACES USING THE ARCHIVED AERIAL AND CARTOGRAPHIC MATERIALS

**B. Chetverikov, L. Babiy**

Lviv Polytechnic National University

**Key words:** cartographic materials, Erdas Imagine, GIS, archival aerial image, space image, archival cadastral plan.

### Introduction

One of the important and very interesting bearer of culture of any nation is a cemetery. In many countries with ancient culture the tradition to visit burial places is no less than meetings with their contemporaries. Cemeteries are integral part of our life and evidence of what had happened on our land, so they are outdoor museums. They remind about famous persons and inform about historical events, attract attention of visitors to building, cultural and art peculiarities of different epochs; connect the past, the present and the future; reflect mentality, traditions and, of course, faith of people. They keep secrets of native culture. Generally in history of a city a cemetery often became the center of authentic culture [1].

Young generation has large interest this heritage and its investigation and scientific researches so far as peculiarities of culture, traditions, Jewish sepulchral rites, and cemetery arrangement are still little-known for society.

A well-known fact that old Jewish cemeteries sunk into oblivion. If there are no culture bearers – there are no cemeteries themselves. But in any way Jewish cemetery continues to implement its functions even if there no new burial on it. After all, destruction of cemetery territory and absence of its external attributes: gravestones, fence, tehare shtibles, macevas does not imply disappearance of cemetery as burials are still underground. According to Jewish religion traditions reburial or transfer of cemetery are impossible. Namely by this requirement the Jewish cemeteries differ from Christian, which are throughout “operating” and therefore following generations take care about their forerunners. Jewish cemeteries are not using during decades – so they are not maintained and therefore are destroyed and reduced to cheap building material.

Most of Jewish cemeteries of Eastern and Western Europe during last sixty years had the same fate: steles were destroyed during the war, later they were moved and used as foundations for dwelling building and their stairs, as basement for roads or pavements, sometimes they were sold to different handicraft enterprises which worked up them into breakstone. The fate of many steles in peace time is well known – they were broken on territory of cemetery and used for different needs of local residents [1].

There are many aspects of this subject which deserve attention of researchers. Implementation of archival investigation is necessary here. But first of all it is necessary to make photo fixation of the steles which have the biggest cultural value and to find the oldest objects which are under threat of extinction.

Geodetic-topographic surveys of cemetery territories with drawing of all existent steles would be very important complement to implementation of registration and photo fixation. Such materials would create the complex documentation of cemeteries which could cease to exist owing to nature, time and human factors.

Problems of renovation of boundaries of historical objects are actively highlighted in the range of scientific papers of B. Chetverikov [2, 3]. There are many scientific papers on this theme of other researchers in Ukraine and around the world too.

### Determination of boundaries of ancient burial places

The aim of the work is reproduction of historical boundaries on the modern urban situation where ancient burial places (cemeteries, mass grave, etc.) were located.

For realization of this task the following materials are used:

- archival German aerial survey of 1943–1944 (National archive of USA [4]) (Fig. 1);
- archival cadastral cartographic materials of XIX century (Fig. 2);
- modern urban situation (plan of geodetic survey, fragments of development plan, large scale topographic plan, etc.) in the scale 1:500–2000;
- space images (if possible).



*Fig. 1. Example of archival image of 1944 on the territory of Jewish cemetery in town Drohobych*

On the initial stage the transformation of archival German aerial images and space images (if available) is implemented. Transformation is done using specialized photogrammetric software [5] (Erdas Imagine, Envi, etc.). Next step is interpretation of archival aerial materials and searching objects of ancient burial places (cemeteries, mass grave).

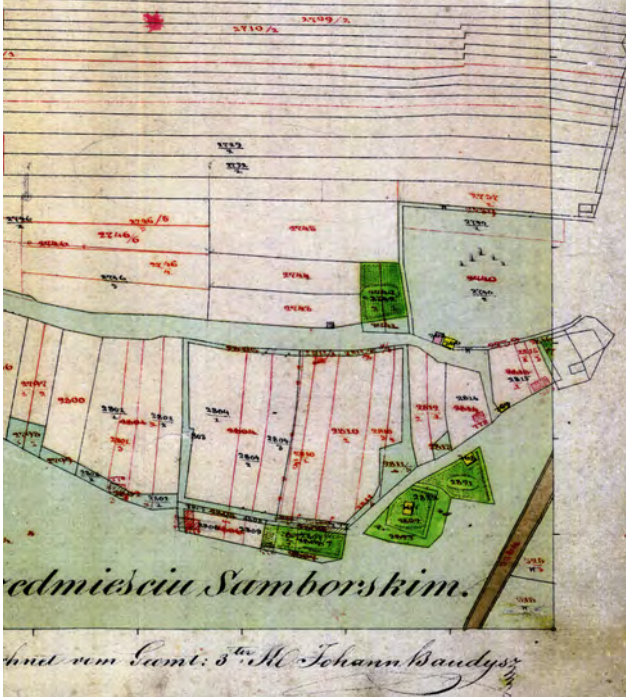


Fig. 2. Example of archival cadastral plan of end of 19<sup>th</sup> century on the territory of Jewish cemetery in town Komarno

Using professional GIS software [6] (MapInfo, ArcGis, etc.) the referencing of all cartographic materials to united cartographic projection and coordinate system (identical to early transformed aerial and space images) is done. Synthesis of images was implemented using integrated functions of GIS for work with raster images, namely the function of background transparency. The following data are synthesized:

– archival aerial image – modern plan of geodetic survey (Fig. 3);

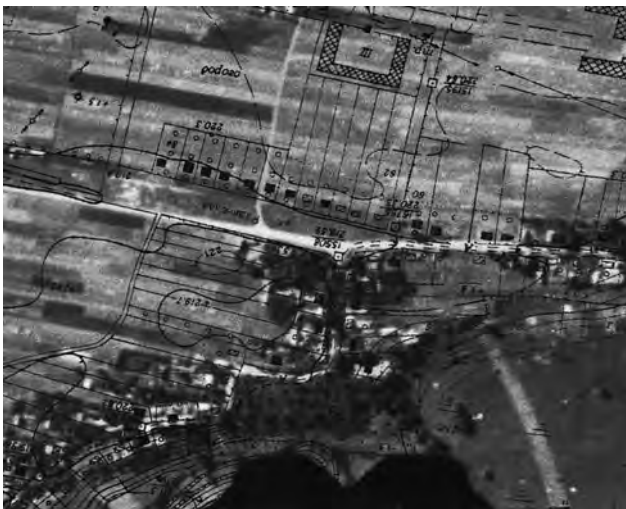


Fig. 3. Variant of synthesis of archival aerial image with modern plan on the territory of Jewish cemetery in town Bus'k

– space image (if available) – modern plan of geodetic survey (Fig. 4);

– archival cadastral plan – modern plan of geodetic survey (Fig. 5);

– archival aerial image – archival cadastral plan (Fig. 6);

– space image (if available) – archival cadastral plan.



Fig. 4. Variant of synthesis of modern space image with plan on the territory of mass graves of Italian military prisoners in town Vynnyky

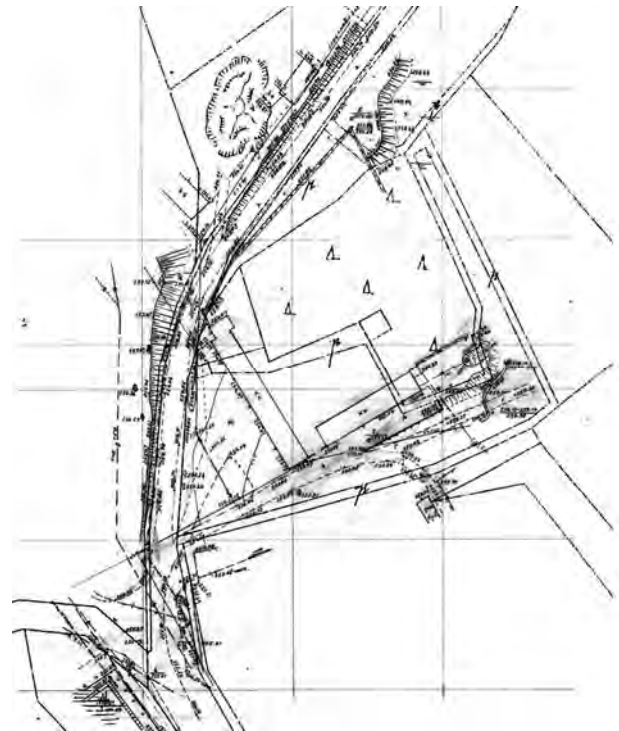


Fig. 5. Variant of synthesis archival cadastral plan of the end of 19<sup>th</sup> century with modern plan of geodetic survey on the territory of Jewish cemetery in town Zhydachiv

Obtained synthesized images are processed, the boundaries of burial places are shown with different colors (in separate layers those that obtained from aerial image and archival cadastral plan), the legend is created (Fig. 7).

Ready materials are preparing and printed in the scale 1:500–1:1000.

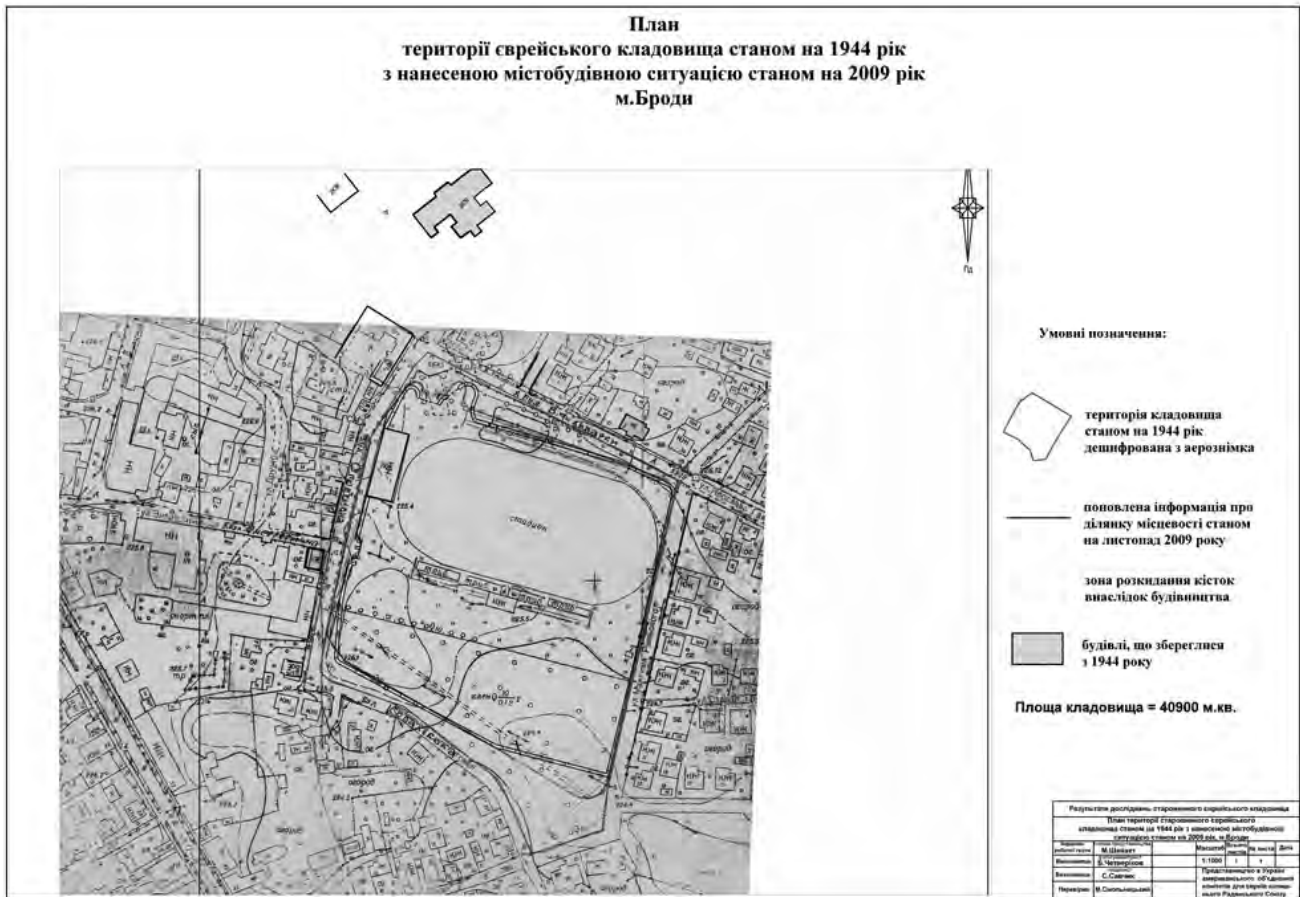


Fig. 7. Sample of final variant of renovation of boundaries of Jewish cemetery in town Brody



Fig. 6. Variant of synthesis of archival German aerial image with archival cadastral plan on the territory of Jewish cemetery in town Zhydachiv

Later created graphical materials in the form of the passports of objects are given to the authorities of cultural heritage, location places and city or village councils.

### Conclusion

The paper considers the problems of the destruction of ancient Jewish cemeteries over time. The method of determining their boundaries using archived aerial and cartographic materials is proposed. It is listed the software that should be used for such tasks.

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**Визначення меж стародавніх поховань  
за архівними аеро- та картографічними матеріалами**  
Б. Четвериков, Л. Бабій

Розглянуто проблематику руйнації старовинних єврейських цвинтарів з плином часу, запропоновано методику визначення їхніх меж з використанням архівних аеро- та картографічних матеріалів. Подано програмне забезпечення, яке доцільно використовувати для таких задач.

**Определение границ древних захоронений  
по архивным аэро- и картографическим материалам**  
Б. Четвериков, Л. Бабий

Рассмотрена проблематика разрушения древних еврейских кладбищ со временем и предложена мето-

дика определения их границ с использованием архивных аэро- и картографических материалов. Предложено программное обеспечение, которое желательно использовать для таких задач.

**Determination of boundaries  
of ancient burial places using the archived  
aerial and cartographic materials**  
B. Chetverikov, L. Babi

The paper considers the problems of the destruction of ancient Jewish cemeteries over time. The method of determining their boundaries using archived aerial and cartographic materials is proposed. It is listed the software that should be used for such tasks.

## Найдостовірніша та найновіша інформація

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- результати тектономагнітного та електромагнітного моніторингу сейсотектонічних процесів на Карпатському геодинамічному полігоні
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