

## PHOTOGRAMMETRIC PROCESSING OF ARCHIVAL AERIAL IMAGES FOR A HISTORICAL MAP OF "BREST FORTRESS" CREATION

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### Statement of the problem.

Subject preservation of historical monuments is quite relevant. They confirm the events and cultural phenomena and are sources of information, containing information regarding certain aspects of the past as Ukraine and its people and neighboring countries.

A host of organizations and regularly hosts discussions on conservation and restoration of historical monuments. For example, the Convention on the Protection of the World Cultural and Natural Heritage stated that cultural heritage are increasingly threatened with destruction, caused not only by the traditional causes of damage, but also the evolution of the social and economic life, so there is a need for the preservation and restoration of historical objects' objects and cultural landscapes. [1] Also in the International Charter for the Protection and Restoration of Monuments and Sites (the Venice Charter, 1964) indicated that the case study and preservation of the historical heritage of the peoples of the world need help all branches of modern science and technology. A significant contribution can be made and photogrammetry, including photogrammetric methods [2]. Taking a purely geodetic methods and time-consuming difficulties associated with direct access to the object. Modern digital technology can make shooting and processing images in the shortest time possible and much safer for the performers. The main advantage of photogrammetric methods is that at any given time you can get the spatial coordinates of the points of the object, ie the idea of its shape and size. The special value of these methods take in when you want to measure a large number of points. Photogrammetric processes are fully automated through the use of digital images [3].

### Analysis of recent research and publications devoted to the solution of this problem.

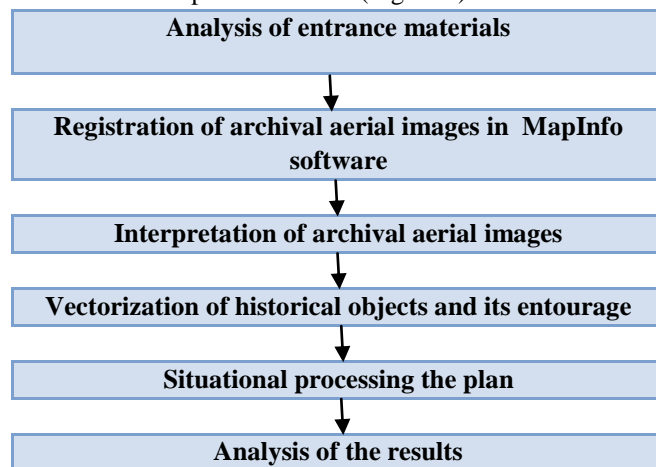
Historical cartography for tourism purposes has recently undergone considerable development. If you take the objects of the Second World War, then on the basis of archival aerial photographs created historical maps of Babi Yar and Syretskiy concentration camp [4,5]. In general, a large number of maps and charts of historical events, both in Ukraine and abroad. But much of this kartmaterialu a schematic view.

In contrast to these cards, we proposed flowsheet card making Brest Fortress on the basis of aroznimannya 1944, through which we get a much more accurate material.

**The aim of the article.** Thus, the purpose of the plan is to create situational Brest Fortress as 1944 for archival aerial photographs using the software package MapInfo. Also, you need to analyze the opportunities provided by MapInfo software to create contingency plan. With this package vektoryzuvaty interpret and archive digital photo to create contingency plan of the Brest Fortress.

### The main material.

To achieve this goal proposed technological scheme that reflects all phases of work (Figure 1).



*Fig. 1. Technological scheme of map "Brest Fortress" creation*

Input data to create a situation plan of the Brest Fortress is: Archival aroznimok Brest Fortress received June 21, 1944, and the current space picture obtained from the GeoEye-1 satellite in 2012 (Fig. 2).

### Registration a raster image

A raster image is constructed from individual elements (pixels), typically located on a regular basis. Most applications of computer graphics, raster image appears two-dimensional array of pixels, the color and brightness of each of which are set independently.



a)



b)

Fig. 2. Imprint remote sensing: a) German Archives aeroznimok Brest Fortress received in 1944; b) the current space picture obtained from the GeoEye-1 satellite in 2012

When you register of archival aerial photographs and satellite images selected modern projection WGS84. As the measurements set - feet

Image Registration was performed on nine common points of reference that have been identified in both images. When you register of archival aerial photographs of the German maximum error was 4 pixels, a part of the admission for this image. And the greatest error of satellite images was 1 pixel, which is also in the area of permissible values as one pixel 1.65 meters for multispectral images obtained from satellite GeoEye-1.

#### Raster vectorization

After registering raster vectorization carried objects and layered organization of the database, which in MapInfo exists as attribute tables. The first layer interpreted and vektoryzovano fence fortification of the Brest Fortress. Fence vektoryzovana as poliliniynyh objects with the appropriate symbol (Figure 3) [6].



Fig. 3. Vektoryzovanny layer fence fortifications, Brest Fortress

Similarly, to create a vector layer fence, opening a new table and adding it to the map, created vector layers: hydrography, buildings, vegetation, roads, Plantation.

During layout maps prerequisite is the correct placement of vector layers. In Management Editor sloyamy lowest layers of polygonal objects placed above them field line and the highest point (Fig. 4).

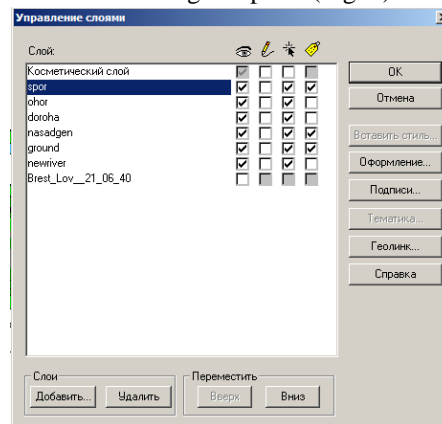


Fig. 4. Dialog "Manage of layers"

The result of the work is shared visualization of all layers, reflecting the territory of the Brest Fortress, as of 1944 (Figure 4).



Fig. 4. Vektoryzovana the Brest Fortress in software package MapInfo

#### The layout and preparation of maps for printing

Before prepress field created workspace A1. By this workspace added archival aeroznimok coated with it all vector layers in a transparent manner (Fig. 5). Scaled image is 1:6000 (Fig. 6).

Also added and photo collage that early and prepared a brief historical information about this object.

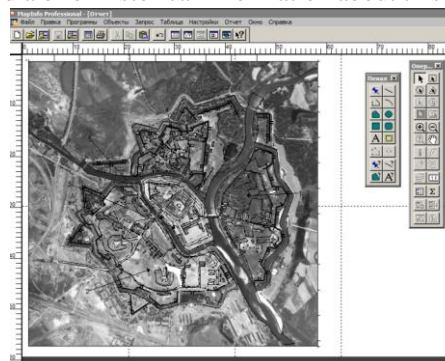


Fig. 5. Vektoryzovani layers as outlines and archival snapshot added to workspace "Report"

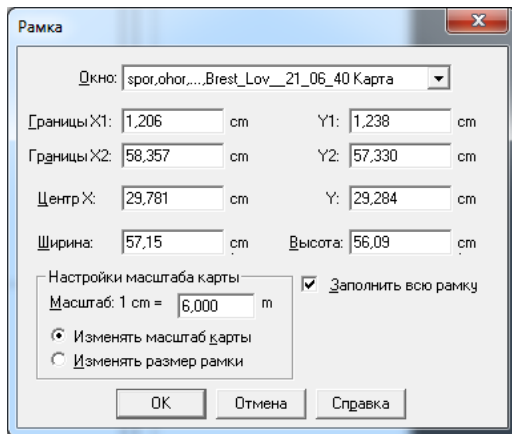


Fig. 6. Dialog "Frame"

To create pozaramkovoho processing tools used Polygon, Rectangle, located on the panel toolbar.

The result of the Brest Fortress contingency plan as of 1944 with podpnoyu additional information (Fig. 7).



Fig. 7. Established situational card at the Brest Fortress 1944

### Conclusions

The theme of the revival and preservation of historical monuments, which absorbed the spiritual heritage of the past is very relevant. This emphasizes the different organizations that are established to preserve historical monuments.

The technological scheme of situational maps Brest Fortress, according to which:

- In the software package MapInfo registered German archival aerofotomaterial received in 1944, with a maximum error of 4 pixels and cosmic snapshot derived from satellite GeoEye-1 with a maximum error of 1 pixel;
  - for archival aerial photographs interpreted and vektoryzovano all objects that were in the Brest Fortress;
  - drafted and prepared for printing situational plans Brest Fortress as of 1944 in the scale of 1:6000.
- Otrymatsi materials is planned to provide a historical memorial complex "Brest Fortress" in m.Brest (Belarus).

### References

1. Konventsiya pro okhoronu vsesvitn'oyi kul'turnoyi i pryrodnoyi spadshchyny UNESCO; Konventsiya, Mizhnarodnyy dokument vid 16.11.1972// <http://zakon2.rada.gov.ua>;
2. Khvedchenya S. B. Istoryko-kartohrafichnyy aspekt u vyvchenni pam'yatok istoriyi ta kul'tury Ukrainy // Istoryko-heohrafichni doslidzhennya v Ukraini. — K., 2004. — Chyso 7. — S. 103–117.
3. Khvedchenya S. B. « Kartohrafichne zabezpechennya pam'yatkoznavstva» // Spetsial'ni istorichni dystsypliny: pytannya teorii ta metodyky. — K., 1997. — S. 244–251.
4. Chetverikov B. Vstanovlennya istorychnykh mezh urochyscha Babyn Yar na osnovi arkhivnykh kartohrafichnykh materialiv// Suchasni dosyahnennya heodezychnoyi nauky ta vyrobnytstva. – Vyp.II(20). – 2010. – S.160-166;
5. Chetverikov B. Metodyka stvorennya sytuatsiyoho planu Syrets'koho kontsentratsiyoho taboru za arkhivnymi aeromaterialamy// Suchasni dosyahnennya heodezychnoyi nauky ta vyrobnytstva. – Vyp.II(22). – 2011. – S.184-187;
6. Svitlychnyy O. O., Plotnyts'kyy S. V. Osnovy heoinformatyky: Navchal'nyy posibnyk/ Za zahal'noyu redaktsiyeyu O. O. Svitlychnoho.- Sumy VTD «Universytets'ka knyha», 2006.- 293s.

### Photogrammetric processing of archival aerial images for a historical map of "Brest Fortress" creation

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The technological scheme of creation of situation historical map "Brest Fortress" on the base of interpretational possibilities of German archival aerial images obtained in 1944 was suggested. Presents a methodology for its implementation.