Preliminary Project Donja Gradina

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Content

1. Introduction

Dinamic development of technigue and disciplines which cover data acquisition and study of the Earth and its surface, initiated presumption that by the help of photogrammetry, graphic bases for the whole area of ustasha camp Jasenovac can be done, and by the help of remote sensing, the places on which there may be traces of mass graves can be discovered. In that way the frames for for further searches by Ground Penetration Radar- GPR, can be set, and by archeological methods, initiatives for creation of geographical information system can be confirmed. GIS ought to unit all spatial and alphanumeric data. Also, it ought to confirm mutual position and connection of those data. In that way the historical science gets a full meaning and accelerates and simplifies data search, comparative analysis and making conclusions. The final result is efficient learning process and more efficient search of number of victims.

1.1 The aim of research

The primary aim of this research is to set possible locations, shapes and size of mass graves. The aim is to be reached by classification, analysis and interpretation of images, and by creation of data bases and GIS.

1.2 Expected results

The results of research are to be realized by making of:

- orthophoto maps plans,
- digital model of terrain,
- GIS,
- simulated model of camp and
- presentation of attained results on Internet.

By some additional work, collected data and given results may be used to create spatial plan of this area.

1.2 Methodology of research

Digital processing of satellite and airimages by methods of remote sensing, with application of contemporary methods for precise setting of points in space, are to define possible locations of mass graves. Analysis of all spatial, and other important data, are to be done by GIS methodology.

2. Required data

In order to get valid results by method of remote sensing, it is necessary to posess high quality airimages and satellite images. Airimages have high spatial resolution necessary for making graphic bases of big scale and for sharpening of satellite images. For this purpose, it is necessary to have the latest airimages. But, in order to reconstruct circumstances appeared immidiately after the Second World War, it is necessary to have old images. Satellite images which cover invisible part of electromagnetic spectre (infrared and radar) enable collecting informations about mass graves. Those informations can not be attained by processing of clasic airimages. In the case of a shortage of new airimages and in order to create graphic bases of big scale, it is necessary to get panhromatic satellite images of high spatial resolution.

Because of information about airimages and satellite panhromatic images kept in Russian archives and because of contacts we had, it is supposed that the purchase of the images may be realized without charge. In that way, the total expense would be decreased.

For the need of precise images orientation in space and according to geodetic standards, it is necessary to measure coordinates of Ground Control Points (GCP) and to get geodetic plans, topographic maps (TK) and other spatial data containing researches done until now. The mentioned data are going to enable generating digital elevation model (DEM), necessary for making orthophoto plans and maps.

Other data, such as historical documents, reports of witnesses, antrophological data, photografs and etc., are needed to be linked with above mentioned spatial data by the principles of GIS. This would enable making paralel multitemporal and spatial analyses, search of all data, making thematic maps, reports and etc.

3. Activities

3.1. Making preliminary, detailed project;

3.2. Scanning, review and archiving all collected spatial data;

3.3. Collecting and converting all alphanumeric data into a digital form;

3.4. Vectorisation of scanned reproductive originals (RO) of TK scale relief 1: 25000 and geodetic plans as well as data praparation for DEM generating;

3.5. Measuring coordinates of GCP and coordinates of contigous points of mass graves by contemporary Global Position System (GPS)

3.6 DEM generating;

3.6. Precise orientation of images in space (geocoding)

3.7. Making mosaics of images;

3.8. Classification, analysis and interpretation of satellite multispectral images;

3.9. Spatial analysis and analysis of images belonging to different periods (multitemporal analysis), and interpretation of airimages and satellite images. Extraction possible locations of mass graves;

3.10. Making orthophoto plans of 1: 25000 scale of the area of D. Gradina and orthophoto maps of 1: 10000 and 1: 50000 scale of remaining area of research;

3.11. Database creation, integration all attained and collected data into GIS, and making applications;

3.12. Making simulated model of the area of camp;

3.13. Making presentation of attained results on Internet;

3.14. Users' training

4. The phases of research

I phase - identification and collection of all important data, preparation all avaliable data for the need of digital processing and archiving

In this phase it is necessary to define area of research and to contact all institutions, in our country and abroad, which may have data we need for the research. Also it is necessary to supply these data. Along with these activities, the following activities are to be done:

- scanning and archiving reproductive originals of TK and cadastrial plans,
- data vectorisation,
- data preparation for DEM generation,
- scanning and archiving airimages and satellite images,
- preliminary analysis and setting abilities of image classification and interpretation,
- collecting and converting alphanumeric non-spatial data into digital form,
- projecting database structure,
- purchase minimum of PC configuration.

II phase - digital image processing and making graphic bases for GIS

This phase is to start after getting panhromatic images with spatial resolution of 1m because of identification of details and selection of orientated points which coordinates are needed to be measured. Then, the following activities are to be done:

- completation PC configuration and software purchase,
- images geocoding and making orthophoto and mosaics,
- DEM generating,
- classification, analysis and interpretation of images,
- multitemporal and spatial analysis and interpretation of all images,
- making orthophoto plans of 1:2500 scale for the area of D. Gradina and orthophoto maps of 1:10000 and 1:5000 scales for the remaining area of research,
- database creation, integration all attained and collected data into GIS, and making applications.

Note: at the end of this phase it is possible to check attained results by georadar examinations and by trial boring.

III phase - transfer of technology and GIS exploiting

In this phase users are to be trained to do the following activities: updating and using GIS, making simulated model of the area of camp and making presentation of attained results on Internet.

Costs of phases in US dollars

PHASES	I	II	III
Multispectral images (RGB + NIR)[1]	8500		
Panhromatic images		10500	
Radar images		5000	
Thermal IR images		N/A	
Images kept in archives in our country and abroad (Slovenia, Croatia, Bosnia and Herzegovina, Russia, USA)	N/A		
Activities I Scanning, vectorisation and archiving RO TK Data preparation for DEM Scanning and archiving images Preliminary analysis Collecting and converting alphanumeric data[2] Structure databases projecting	10000		
Minimal PC configuration	6000		
Activities II GPS measurement Image geocoding DEM generating Classification, analysis and interpretation Multitemporal analysis Making orthophoto maps and plans Database and GIS		20000	
Remaining PC accessories		6000	
Software		10000	
Training			1500
Making simulation and Internet presentation			2000
Total	24500	51500	3500
Making preliminary and detailed project	2000		
Total	81500		

5. Accessories and software

It is necessary to get the following PC accessories:

- three computers of high performance (two of them for digital processing of spatial data and one of them for GIS and database creation),
- CD writer
- colour printer (minimum B2),
- scanner A3 with modul for transparent scanning,
- network equipment,
- UPS.

During measurement GCP it is necessary to hire:

- two GPS receivers and
- software for processing collected data.

For databases creation, GIS and DEM generating and standard of formates adjustment it is

[1] Multispectral images have been already bought
[2] Initial datainput necessary for research

necessary to supply:

- software for image processing (TNT mips or ER Mapper) and
- software for GIS (Arc View).

7. Experts

The following experts are to be engaged:

- remote sensing specialists,
- engineers of geodesy (GPS measurement and data processing) and
- IT engineers.

6. Terms

I phase is to cover the period of six months and it is to start immidiately after purchase material and advance payment. The result is to be global review of the problem and possibilities of research mass graves from system of Croatian ustasha camps of genocide by methods of remote sensing and GIS.

II phase is to cover the period of eighteen months and it is started immidiately after settling all obligations from the first phase, satellite images supply, software supply and completation PC accessories. The result is to be the data about possible locations of mass graves and making graphic bases and GIS creation.

III phase is to cover the period of six months, and it is started immidiately after settling all obligations remaining in the second phase. In this phase, users are to be taught how to use and update GIS. Also, simulated model of the area of camp and presentation on Internet are to be done.

Note: There may be exceeding of terms due to possible delay of purchase images, equipment and software.

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