The Importance of Digital Technology Programs in Conducting Archaeological Research

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Article History	Abstract
	This article provides information on the use and convenience of digital technologies in archaeological research. The use of geographic information system (GIS) in archaeological research and its importance in providing archaeological conclusions is discussed. Also, the author gave information about the application of QGIS, SRTM, SAPR, ESRI and other programs in archeology and the use of GIS programs for the development of archeology.

1. Introduction

Geographical Information System (GIS) is a computer program designed for registration, assessment, nature protection, rational use of natural resources and their monitoring, modeling and pre-thinking of various processes. GIS is based on the science of geography, it includes cartography, statistical analysis and database. It analyzes spatial regions and creates maps and scenes in 3D on layers. In almost every field of research, many organizations are changing the way they conduct research, using GIS to communicate, analyze, share information and create maps that solve complex problems around the world (Konovalova N.V., Kapralov E.G. 1997). This system, which was first introduced in the military field in the 1960s in the USA and Canada, has been used in the field of *archeology* since the 1990s . Today, the combination of archeology and GIS is understood as a perfect harmony (Nsanziyera AF, Rhinane H., Oujaa A. and Mubea K. 2018, R. 21).

The following can be noted as the main features of GIS:
- geographic (spatial) connection of data;
- creating a new information system by analyzing existing sources;
- describing the spatial-temporal relationship between objects;
- availability of quick changes and other features based on information collected in the database.

2. Methods and level of study
The article used generally accepted historical methods - methods of measuring modern information technologies.

3. Research results
The ability to work on multi-layered and multifaceted spatial frames through GIS programs not only facilitates archaeological research, but also serves as a very convenient tool for processing extensive spatial data. Historically, GIS software was first developed in the 1950s and 1960s, and was limited to motor vehicle (USA) and land management (Southern Canada) and solving socio-geographical disparities and extracting views that represent the general picture of their functional details. was By the 1970s, GIS programs were slightly refined. Due to the success of working with GIS and using it in pilot tests, it soon became the main research software. These research programs were developed by the Environmental Research Institute - ESRI, which is still a private software vendor. In addition, Howard Fisher's laboratory at Harvard University (USA) played an important role in the development of GIS during the 1960s-1980s. This laboratory is specialized in graphic and spatial computer analysis and created programs SUMAP, SUMVU, GRIO, ODISSEY. In Russia, people interested in GIS began to increase after the XXIII Congress of the International Geographical Union held in Moscow in 1976. The collection "New ideas in geography" was published in it, and for the first time in the collection articles devoted to GIS were published in Russian. By 1990, the use of GIS became more active. Now, every year, the US National Geographic Society, the American Geographical Association and the ESRI have declared November 17 as the World GIS Day.

Today, QGIS is widely used by researchers, which is based on GIS software, which is an open digital, highly accessible and public software system. The program was developed in 2002 and was founded in the same year as a project of Source Forge (a software development organization). QGIS was developed using the QT (software development kit) toolkit and is currently available on most UNIX platforms, Windows and MacOS (a graphical operating system for computer systems).

Research with the GIS approach is considered a scientific approach that is carried out by applying the achievements of modern natural sciences and technological innovations in the identification of ancient monuments. In this case, *the research object* is spatially analyzed using modern technologies, and unknown ancient monuments are identified in areas that are difficult to be covered by conventional archaeological observations (Maksudov F.A. 2020, B. 44-67).

A new positive approach to research is the basis for GIS. Because operations such as territorial demarcation of monuments, identification of their excavation points, separation of their components are carried out. This is a simple and simple operation for GIS.

In the late 1980s and early 1990s, the first GIS programs that began to be widely used around the world were focused on working with vector or raster data. Its capabilities are now greatly expanded and include more and more software functions. The GIS system is divided into the following depending on the problem to be solved: Land information systems (ZIS), Cadastre (KIS), ecological (EGIS), educational seas and other GIS programs are attached for other directions. The most common are geographic information systems, which are used in conjunction with large volumes of data. The use of CAD (computer aided design) is common in GIS programs and is very useful in research. These include: 3D reconstruction, remote sensing of the natural environment, digital image analysis, and remote sensing research.

Software for displaying, managing, and analyzing such space data generates Geo-spatial data. For example: CAD, remote sensing or photogrammetric programs produce with data that has geographic information. CAD Software Design:

- Switch between two-dimensional (2D) and three-dimensional (3D) views.
- Zoom in and out for near and far view.
- Adjust pictures to observe them from different points.
- Change the scale of images: When one value changes, the corresponding values are automatically adjusted.
- Switch to Image mode: Changing a part of the image will automatically change the whole image.

These Geo-spatial data are dedicated to GAT, but references are also made for other Geo-spatial programs that may work together or complement GIS. Currently, GIS is widely used in many studies. In the last 20 years, GIS has become increasingly important in archaeology.

Shuttle Radar Topography Mission (SRTM) is a special radar system and is an international research project. It creates a digital elevation model using a radar topographic survey of the earth's surface. Currently, the digital models obtained are 80 % of the earth's surface. Such modern studies in the field of archeology show the exact location of monuments (Akasheva A.A. 2011, p. 52).

Today, the science of archeology works on the basis of concrete data in the study of places. Therefore, in archaeological research, it is convenient to identify the traces left by ancient people, that is, archaeological objects, through GIS programs. In studying the possibilities of discovering, analyzing and comparing the traces of human activity, transitioning to various GIS-based methods (QGIS , ArcGIS, Google earth, SASPlanet, SUMAP, SUMVU, GRIO map) is becoming important in obtaining accurate information in archaeological research (Orengo H. 2015 , P. 86) .

One of the most important tasks of GIS is remote sensing of the earth. Remote sensing makes it possible to obtain information about objects located on the surface and in the interior of the earth. Another of its tasks is to observe different zones of the earth or sea surface visibility from space and to carry out important work. When photographing objects from a distance, photographing the sun's rays in reflected situations can be of poor quality, therefore, the areas identified during the research are activated with radio waves and thus the product is brought to a quality state (Scianna A., Villa B. 2011. R. 342).

Environmental studies of the past are now being extensively researched through GIS programs and this is showing results. It is also possible to study past societies, their interactions with nature, and the consequences of environmental changes due to changes in nature on historical landscape maps created through GIS programs.

4. In conclusion

It can be said that the use of modern technologies in archaeological research creates many conveniences for the researcher. The introduction of the GIS direction into the science of archeology is convenient for determining the location of unexplored archaeological objects, analyzing data, creating digital maps, and making presentations. Many opportunities for studying the Earth's surface through artificial satellites allow visualization of past places in archeology and other fields. Also, accurate information about the ancient condition of archaeological objects is obtained. Due to the large number of possibilities of GIS programs, it is appropriate to use it widely today. It is useful in researching archaeological objects, saving money, manpower and, especially, time. In addition, GIS programs serve as a necessary tool in turning historical archaeological monuments into tourism centers.

5. List of references:

1. Akasheva A.A. Spatial data analysis in historical sciences. Application of geoinformation technologies. - Nizhny Novgorod, 2011.

2. Konovalova N.V., Kapralov E.G. Introduction to GIS: textbook. - Moscow: GIS Association. 1997.
3. Korobova D.S. Fundamentals of geoinfarmatics in archeology. - Moscow. 2011.
4. Laikin V.I. Uporov G.A. Geoinfarmatics. - Komsomolsk on the Amur. 2010.
5. Maksudov F.A. In the Middle Ages, the mountainous nomadic culture of Ustrushon (written to obtain a DSc degree in historic sciences from the auto-referencing of his dissertation). - Tashkent. 2020.
6. Safarov E.U., Musaev I.M., Abdurahimov Kh.A. Geoinformation systems and technologies. - Tashkent. 2011.
7. Herbert D.G. Geographic Information Systems in Archeology. – Center for Archaeological Investigations Press - 1996.
8. Nsanziyera AF, Rhinane H., Oujaa A. and Mubea K. GIS and Remote Sensing Application in Archaeological Site Mapping in the Awsard Area. - Morocco. 2018.
9. Orengo H. Open Source GIS Geospatial Software for Archaeology: Towards its Integration into Every day Archaeological Practice. – Warsaw. 2015.
10. Scianna A., Villa B. GIS Applications in archaeology // Archeologiae Calcolatori, № 22. 2011. Italian National Research Council. – P. 337-342.
11. Stride S. An Archaeological GIS of the Surkhan Darya Province. – Barcelona University. 2004.