

# Territory Modeling With Computer Graphics, Rendering and Geographic Information Systems

Dmytro Karnaukhov<sup>1</sup>  
Nataliia Yeromina<sup>2</sup>

<sup>1</sup>Kharkiv National University of Radio Electronics, 14 Nauky Ave,  
Kharkiv UA-61166, Ukraine, [dmytro.karnaukhov@nure.ua](mailto:dmytro.karnaukhov@nure.ua)  
<sup>2</sup>Kharkiv National University of Radio Electronics, 14 Nauky Ave,  
Kharkiv UA-61166, Ukraine, [nataliia.yeromina@nure.ua](mailto:nataliia.yeromina@nure.ua)

**Abstract.** *The main goal of this thesis is to analyze existing technologies for three-dimensional modeling of architectural objects, including a comprehensive analysis of the adjacent territory. Visualization of the object and the corresponding relief, complemented by powerful analytical capabilities. It is carried out with the proposed effective set of tools in the environment of a geographic information system. The considered proposals for the use of three-dimensional modeling programs in geographic information systems will significantly simplify and improve interactions with them, as well as expand their areas of application.*

**Keywords:** GIS; terrain model; ArcGIS; vector; three-dimensional; software; geographic

## I. INTRODUCTION AND PROBLEM STATEMENT

Currently, there is a steady interest in the three-dimensional representation of objects in the urban environment and the city as a whole. A 2D image will not provide as complete a representation of an object as a 3D model.

In addition to creating the effect of visual presence, such objects are focused on various social and commercial projects. However, supplemented by the powerful analytical capabilities of modern geographic information systems (GIS), 3D models containing information about all the resources of a city can become an effective object for managing all of its fixed assets.

A comprehensive analysis of the territory will make it possible to solve significantly more important and new problems that cannot be solved by classical means and methods. Here are some of the challenges that are promising from the point of view of modern information technology:

- visualization of all essential natural and artificial objects;
- planning of major repairs, reconstruction and demolition of objects;
- search and investment appraisal of land plots for development;
- storage and use of multi-format data in one place, which will allow you to track and analyze past data to predict and compare changes in the situation;
- implementation of virtual tours, excursions to cultural and historical places of the city.

## II. PROBLEM SOLUTION AND RESULTS

Basically, for solving urban planning and management problems, such software products as Autodesk 3D's MAX and AutoCAD are used, and the capabilities of GIS in our country have not yet found wide application in the practice of architectural design.

This paper presents the combination of software (software) "ArcGIS" and "Autodesk 3D's MAX". Today, ArcGIS software is the undisputed world leader among geographic information systems.

ArcGIS software consists of 3 main components:

– ArcMap - allows you to create maps and work with them: visualization, editing and analysis of spatial data, creating reports, graphs and layouts of maps.

– ArcCatalog - management of spatial data storage, database structure, recording and viewing metadata.

– ArcToolbox - a set of tools for performing many individual tasks, spatial and other operations with data. In recent versions of ArcGIS, these tools are included in ArcMap and ArcCatalog as a separate toolbar.

The combination of ArcGIS and Autodesk 3D's MAX software has a number of undeniable advantages, the main of which is the creation of a highly realistic digital terrain model (DTM) using the obtained spatial data.

– Construction of a high-precision hydrologically correct digital elevation model required for design work.

– Calculation of geometric characteristics of designed and existing objects (lengths, areas, perimeters), taking into account the terrain; calculating the free area and determining the distance between residential, public and industrial buildings.

– Determination of the steepness of slopes, directions of water flow and flooding zones. The slope is needed to determine the most even and flat terrain area.

– Construction of visibility zones and panoramic panoramas.

## III. CONCLUSIONS

The DEM increases the efficiency of solving urban planning problems and is intended for use by government agencies (ministries, federal agencies, departments, prefectures and municipalities), architects, designers, planners, developers, realtors, investors.

You can store and view information: in the form of vector maps, space images, photographs, three-dimensional models, schemes, plans, diagrams, graphs, tables, databases, multimedia information and text documents, since it is necessary to compare and analyze new and old data in space and in time, predict events, etc.

Thus, the three-dimensional representation and display of objects in relation to the corresponding territory significantly expands the scope of geographic information systems and is a powerful analytical tool.

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