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Remote Sensing in Real Estate Management

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Abstract

The article studies the use of remote sensing for real estate management. The advantage of remote sensing in the observation of global processes on the earth's surface is shown. It is shown that the greatest effect from the use of remote sensing is obtained with a comprehensive study of objects and territories. The importance of processing space images for solving ground-based problems is determined. The feature of multispectral shooting and its use is shown. The difference between active and passive methods of remote sensing is shown. Weak use of this technology for real estate management is revealed. An analogue of this technology has been found. These are precision agriculture technologies. Technology of precision agriculture is based on the application of remote sensing of the Earth. They are aimed at the study of territories and the analysis of land resources. Remote sensing technologies for property management are also aimed at the exploration of territories. But then they are directed to properties. Remote sensing technologies for property management use space-based methods to monitor objects and determine their condition. The article introduces a new concept of “real estate field”. It is analogous to the concept of “monitoring field”. The concepts of using remote sensing in real estate management are described.

Keywords: space research, remote sensing, real estate, real estate management, real estate field.

1. Introduction

Remote sensing data are effectively used to solve a wide range of control problems in the native environment and anthropogenic objects. Remote sensing data (DDS) are highly informative and reliable (Pearlman et al., 2019). The main areas of use of DDSinclude: the study of natural resources; the study of subsoil; study of large engineering structures and construction projects; environmental monitoring; global monitoring. The greatest effect from the use of DDS is obtained in a comprehensive study of objects and territories.

Space images are multi-purpose (Yeh et al., 2020). They are used as an integrated information base for conducting complex, interconnected studies of the natural environment. The results of thematic processing of space images can be presented in the form of a series of coordinated thematic maps reflecting the spatial location, qualitative and quantitative characteristics of natural and economic objects of the corresponding territory.

Space images contain valuable information about the relationship of natural-territorial complexes, since all these components are reflected simultaneously on them. Landscapes are indicators for determining the properties of various components of the natural environment. Very

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often, complex or industry case studies use the landscape indicative method of data interpretation. It is most widely used in geological, agricultural, municipal, hydrogeological studies. Landscape indication consists in identifying hard-to-observe components from easily observable components.

Tothe osmic images of different ranges, it is possibleto study trends in the development of the urban environment and real estate (Yeh et al., 2020). They make it possible to identify and study these dynamics and to find anthropogenic impacts.

Remote sensing includes passive and active methods. Space imaging is divided into photographic, television, scanner thermal and radar. Photographic and scanner surveys of the earth's surface are formed in panchromatic, zonal, multizonal and multizonal versions. Differences in the reflection spectra of real estate objects serve to assess their physical condition.

With multi-zone imaging (ElMasry et al., 2019), a series of geometrically combined images are obtained in several narrow zones of the electromagnetic wave spectrum. The set of zonal images is much more informative than images in one spectral range. A series of zonal images allows you to use the “spectral image” of the studied objects as a classification feature, providing an opportunity to formalize the spectral brightness of objects. Remote sensing methods of the earth's surface provide a new additional tool for property management

2. Results and discussion

Control technologies and analogues.

The basis for the transfer of remote sensing methods to the field of real estate management is geoinformatics. Geoinformatics is widely used in spatial *economics (*Tsvetkov, 2013) and in the field of real estate management. The emergence of space geoinformatics (Bondur, Tsvetkov, 2015a) is a connecting bridge between space research and real estate management.

An analogue of the application of space technologies for property management are precision agriculture technologies (Sishodia et al., 2020, Tsouros et al., 2019, Shafi et al., 2019). Precision agriculture is a comprehensive agricultural management technology that uses remote sensing techniques. This technological complex includes: global positioning technologies (GPS), geographic information systems (GIS), yield assessment technologies (Yield Monitor Technologies), Variable Rate Technology, remote sensing technology (ERS) and Internet of Things (IoT) technologies. Many solutions Precision agriculture is applicable for property management. Precision agriculture oversees land. Property management also oversees land and plots. The difference lies in the direction of analysis for precision agriculture technologies and for real estate management technologies. There is every reason to apply fragments of precision agriculture technology in the field of property management. These snippets should be complemented by property management tasks.

General principles of real estate monitoring

The scientific concept of remote sensing applications in real estate management is based on a systematic approach (Bondur, Tsvetkov, 2015b). The object of monitoring is treated as a heterogeneous territory. These inhomogeneities can be considered as granules or as heterogeneous sets. Assessment and isolation of these inhomogeneities is carried out using the global positioning system, radar images, space images and space geoinformatics, using geographic information systems. You can introduce a new concept of the property management field. The property management field is an environment that includes the territory and all the factors that affect property management.

When monitoring real estate, an information field model is used (Tsvetkov, 2014) to extract and analyze information as a related mechanism.

The solution of these problems is carried out using artificial intelligence technologies. The collected data is used to assess the condition of the property and management. This concept necessarily requires taking into account the ecological and social characteristics of the territories.

The use of remote sensing for real estate management is aimed at ensuring the sustainable development of territories. Sustainable development of territories and real estate includes three components: social sustainability, environmental sustainability, economic sustainability.

Heterogeneities within the real estate field depend on a number of factors: building density, ecology, transport accessibility, distance from the center and others. To create a field of real estate, geodata is used that takes into account metric, social and economic factors.

The results of remote observations taking into account geodata allow you to create an accurate map of the real estate field. According to remote sensing data, it is possible not only to

monitor legal buildings, but also to identify illegal real estate. The peculiarity of real estate maps is that they can be superimposed with models of fields, for example, environmental pollution.

Management decisions are based on spatial and economic models that take into account the dynamics of real estate development and other external factors. The property management manager makes a specific decision independently, based on maintaining a balance of economic and environmental goals.

Space monitoring

Real estate management technology using satellite technology requires the use of space monitoring and processing of its results. This monitoring is performed in two closed and real-time modes. Closed monitoring includes capturing high-resolution images, processing snapshots, and generating information to support decision-making.

Real-time space real estate monitoring includes online monitoring of real estate objects, including different areas of the spectrum, radar images provide information about the physical condition of real estate and serve as the basis for additional work. The peculiarity of this technology is that it allows real-time monitoring of the state of real estate in a large area in cities and outside cities.

This technology allows you to connect real estate with other infrastructure objects and identify spatial and environmental patterns. This technology allows you to form an extensive statistical base for comparisons based on historical monitoring data. A significant advantage of the technology is a high level of automation of the processes of monitoring real estate crops and interpreting information into an interactive map understandable to a wide range of managers.

The technology of space monitoring of real estate is used by:

- municipal staff to monitor the state of the urban environment;
- business owners (assessment of the state and prospects of the business, making a decision on additional investments, making management decisions);
- investors and analysts (assessment of investment potential, making investment decisions, creating and adjusting forecasts);
- insurance brokers (collection and control of information, verification of data provided by clients, calculation of the tariff scale and the amount of insurance payments);
- road builders (condition and development of the road network);
- state and sectoral institutions dealing with agricultural issues and solving issues of food and environmental security.

Currently, methods are used to quantify the dynamics of urban areas using high-resolution satellite imagery (Shafi al., 2019). Satellite remote sensing provides significant opportunities for monitoring real estate and urban areas through remote sensing capabilities. Video information processing plays a major role in monitoring.

Recently, object-based image analysis (OBIA) has been increasingly used to classify images (Hu et al., 2018).

Remote sensing is used in many industries, from mining to city management, mapping and geoinformatics.

Every year, new applications of remote sensing are developed in various fields: construction, real estate management, transport, urban planning, disaster relief, architecture. There is an online list of the 100 best use cases for remote sensing satellites.

3. Conclusion

To date, critical work in the field of real estate operations and urban development financing has been concentrated within the framework of ground technologies. Property management is based on the interaction of the investor, the developer and the government. Land-based real estate management shows how real estate, assets and investors' goals are being realized through regulatory and tax reforms. Real estate management in a broad sense shows the construction of cities. However, the relationship between real estate transactions and space technologies has not yet been given much attention. However, spatial knowledge and geo-knowledge are necessary for real estate management. Obtaining complete spatial knowledge possibly using space technology.

The connection of remote sensing data to property management expands the possibilities of real estate management strategy and tactics. First of all, this is important for corporate governance. A new emphasis on the application of space information increases the information content of management models and helps to understand how real estate values penetrate in space.

In particular, it demonstrates the key role of information and spatial information in the theory and practice of real estate management.

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