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UPDATING MAPS AND CREATING ORTHOPHOTOS USING SATELLITE IMAGES

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ABSTRACT: *This article is devoted to updating cadastral maps using photogrammetric methods.*
KEY WORDS: *geodesy, cartography, photogrammetry, sounding, geographic information systems, database*
АННОТАТСИЯ: *Данная статя посвящена обновлению кадастровых карт с исползованием фотограмметрических методов.*
КЛЮЧЕВЫЕ СЛОВА: *геодезия, картография, фотограмметрия, зондирование, геоинформатсионные системы, база данных*

Land is a national asset and serves as the foundation of the life, activity, and well-being of the people of Uzbekistan. It is considered one of the most important natural resources. Therefore, ensuring the rational, efficient, and purposeful use of land, protecting land resources, and maintaining the Unified System of State Cadastres—closely linked with land—are among the most essential responsibilities of the state.

Large-scale economic reforms require further improvement of the system for maintaining accurate records of land and land-related resources and ensuring their rational use. Over time, various changes occur on the ground: new settlements and new roads appear, relief and hydrography change. Due to these changes, maps gradually become outdated, which complicates their use, and in some cases renders them unusable. Therefore, topographic maps must be updated regularly.

In recent years, digital cartography, geographic information systems, and remote sensing technologies have been rapidly developing in Uzbekistan, Central Asia, and across the world. In particular, creating large-scale orthophoto maps using high-resolution satellite imagery has become a major digital data source in the fields of state cadastre, land management, urban planning, ecological monitoring, geology, and melioration. Compared to conventional aerial photography, satellite imagery is more affordable, faster, and provides wider

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coverage, allowing large-scale and high-accuracy orthophoto maps to be produced in a short period.

The purpose of this article is to scientifically substantiate the theoretical foundations, technological stages, and practical significance of producing large-scale orthophoto maps through satellite image processing.

Map updating is carried out through direct field inspection, aerial photography, or satellite imagery materials [1].

Preparatory work for map updating includes:

- collecting and systematizing all materials required for updating maps and determining the degree and order of their use;
- identifying changes that have occurred on the ground and their characteristics;
- developing the technical design for map updating.

Among the collected materials, aerial photography data is the most essential, while the remaining ones serve as auxiliary materials. Using transformed aerial photographs, changes on the ground are identified and transferred to the map using stereophotogrammetric methods, or all objects are interpreted directly from photoplans compiled from aerial images [2].

Image interpretation consists of identifying objects visible in the photograph, determining their characteristics, and revealing their nature. Interpretation is one of the most important and complex processes in map compilation and updating. The accuracy of interpretation determines the quality of the produced map. The interpretation process includes several stages: preparation for fieldwork, field surveys, interpretation, delineation of objects on images, correction of errors, and delivery of the final product.

The quality of image interpretation depends not only on understanding the spatial distribution patterns of objects on the ground but also on a deep knowledge of the optical and geometric properties of aerial or satellite photographs. Two main factors form the basis of interpretation:

1. **physical-mathematical** — the optical and geometric characteristics of the image;
2. **geographical** — the spatial distribution of objects.

Successful interpretation requires adequate knowledge and training in geodesy, geography, aerial photography, cartography, and geomorphology. In addition, knowledge of specialized fields such as agriculture, forestry, and geology is also necessary [3].

Depending on the objectives and assigned tasks, image interpretation is divided into two types:

1. general geographic;
2. sectoral (thematic, specialized).

General geographic interpretation aims to obtain generalized information about the Earth’s surface, such as regional and typological zoning, identification of transportation networks, settlements, vegetation, and their

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interrelationships, and is used for compiling and updating topographic maps. It is divided into two types: topographic interpretation and landscape interpretation.

Topographic interpretation is carried out to identify objects that must be depicted on topographic maps, determine relationships among them, and describe their characteristics. It is one of the main processes in map creation and updating.

Landscape interpretation is used to study the Earth's surface, conduct regional and typological zoning, and solve specialized technical tasks.

There are many types of sectoral interpretation. It aims to identify specific characteristics and patterns of objects located on the Earth's surface and in the atmosphere and to solve relevant tasks. The differences between interpretation types are not strict, because the methods and operational procedures applied are similar.

Based on the working conditions, the following interpretation methods are distinguished:

1. **Field method** — involves directly studying objects in the field when they cannot be interpreted from photographs or require detailed investigation. Its disadvantages are labor intensity and high cost, but the resulting maps have high accuracy.

2. **Aerial-visual method** — involves identifying objects from an aircraft or helicopter. This method increases productivity and reduces costs but requires operators to have high skills in quickly orienting and identifying objects within a short time.

3. **Office (cameral) method** — involves identifying objects by analyzing the characteristics of images without conducting fieldwork. Clear visual cues in the photographs serve as the basis for decision-making.

4. **Combined method** — involves performing the main interpretation tasks in office conditions while using field or aerial-visual surveys to identify objects that cannot be interpreted from images alone.

According to the degree of mechanization, image interpretation can be performed using visual, automatic, or combined (human–machine) methods:

1. **Visual interpretation** — currently the primary method. Despite the advancement of automatic methods, visual interpretation remains widely applied, as human visual and cognitive capabilities are superior in many tasks.

2. **Automatic interpretation** includes:

- microphotogrammetric method,
- photoelectronic method,
- spatial filtering method.

3. **Combined interpretation** integrates the advantages of both human operators and automatic systems, enabling more efficient and accurate interpretation.

In the theory and practice of image interpretation, regardless of the method applied, the correct classification of identifiable objects is of crucial importance.

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REFERENCES:

[1] Ilkhomjon Abdullaev; Abdumanap Nasirov; Jonibek Pirimov; Nargiza Abdullaeva Integrated information system for cadastre based on GIS and Web technologies 2022 International Conference on Information Science and Communications Technologies (ICISCT) 10.1109/ICISCT55600.2022.10146844.

[2] J Pirimov, E.Safarov, I.Abdullaev, N.Abdullaeva Application of orthophotomaps in land cadastre E3S Web of Conferences 386 , GISCA 2022 and GI 2022 05008 (2023) https://doi.org/10.1051/e3sconf/202338605008

[3] J Pirimov, F Khudoyberdiev, & S Sattorov (2025). Enhancing spatial data accuracy with innovations in orthophotoplan production for state cadastral systems AIP Conf. Proc. 3286, 050005 https://doi.org/10.1063/5.0280265

[4] 9. J.Pirimov, F.Sh. Khudoyberdiev, K. M. Muhamadov , S. O`. Bobojonov, S. F. Axtamov "Modern Geographic Information Systems in Land Resource Management" Academic Journal of Digital Economics and Stability. Online: https://academicjournal.io. 2021. 66-69-pp

[5] 10. A. R Asatov, J.Pirimov, K. M. Muhamadov, S. O. Bobojonov, S. F. Axtamov "The Importance of Orthophotoplans in Cadastre" Work International journal on orange technology. https://journals.researchparks.org/index.php/IJOT e-ISSN: 2615-8140 | p-ISSN: 2615-7071 Volume: 03 Issue: 7 |Jul 2021. 40-42-pp

[6] 11. J.Pirimov "Update Maps Based on Remote Sensing Materials" International Journal of Formal EducationVolume: 01 Issue: 09 | Sep – 2022 ISSN: 2720-6874 http://journals.academiczone.net/index.php/ijfe. 95-98 pp.

[7] 12. Ж.Пиримов, Ш.Шеркулов "Зарубежный опыт использования аэрокосмических снимков при создании ортофотопланов различных масштабов" Журнал Актуальные проблемы современной науки. – Москва, 2022. – №6 (129) 30-33 с.