localization type into: *area objects^ linear (multilinear) objects^*, and *point objects^*.

At the next stage of developing the ontology of *terrain objects*, we will set the subdivision of *terrain objects* on orthogonal bases, which corresponds to the placement of objects in accordance with thematic layers in *geoinformation systems*.

For each *terrain object*, the main semantic characteristics inherent only to it are highlighted. It should be particularly noted that metric characteristics do not have such a property. According to this classifier, each class of *terrain objects* has a unique unambiguous designation. The classifier hierarchy has eight classification stages and consists *of the class code, subclass code, group code, subgroup code, order code, suborder code, species code, subspecies code*. Thus, thanks to the coding method, generic relations have already been defined, reflecting the correlation of various *terrain object classes*, and the characteristics of a specific *terrain object class* have also been established. Due to the fact that the basic properties and relations are set not of specific *physical objects* but of their classes, then such information is meta-information in relation to specific *terrain objects*, and the totality of this meta-information is an ontology of *terrain objects*, which in turn is part of the *knowledge base* of the *intelligent geoinformation system*.

terrain object
⇒ *subdividing*:*
Typology of terrain objects by localization
^
= {
- point terrain object
  ⇒ inclusion*:
  - well
  - light post
- linear terrain object
  ⇒inclusion*:
  - bridge
- multilinear terrain object
  ⇒inclusion*:
  - river
  - road
- area terrain object
  ⇒inclusion*:
  - lake
  - administrative area

}

VII. SPECIFICATION OF THE MAP LANGUAGE

The *Map Language* belongs to the family of semantic compatible languages – *sc-languages* – and is intended for the formal description of *terrain objects* and the relations between them in *geoinformation systems*. Therefore, the **Map Language Syntax**, like *syntax* of any other *sclanguage*, is the *Syntax* of the *SC-code*. This approach allows:

- using a minimum of means to interpret the specified *terrain objects* on the map;
- using the *Question Language for ostis-systems*;
- reducing the search to most of the given *questions* to searching for information in the current state of the *ostis-system knowledge base*

Denotational semantics of the Map Language includes the *Subject domain and the ontology of terrain objects* and *their geosemantic elements*.

VIII. AUTOMATION TOOLS FOR THE INTELLIGENT GEOINFORMATION SYSTEMS DESIGN

The design of intelligent geoinformation systems is carried out in stages. At the first stage, the knowledge base of the subject domain is formed and for this purpose an electronic map (voluntary cartographic information) is analyzed and translated into the knowledge base of terrain objects with the establishment of geosemantic elements for the corresponding territory. At this stage, it is determined, firstly, to which class the terrain object under study belongs and, further, depending on the type of object, the concept of a knowledge base corresponding to a specific physical terrain object is formed. Thus, many concepts are created that describe specific terrain objects for each class of terrain objects. It should be noted that it is at this stage of the formation of the knowledge base that semantic elements are established. At the second stage of designing an intelligent geoinformation system, the knowledge base obtained at the first stage is integrated with external knowledge bases. At this stage, in addition to geographical knowledge, knowledge of related subject domains is added, thereby it becomes possible to establish interdisciplinary connections. An illustrative example is integration with biological classifiers, which in implementation represent an ontology of flora and fauna objects. Such integration expands the functional and intelligent capabilities of the applied intelligent geoinformation system. Note that at this stage, homonymy is removed in the names of geographical objects belonging to the classes of settlements. For settlements of the Republic of Belarus, this is achieved by using the *system of designations of administrative-territorial division objects and settlements* and semantic comparison of geographical terrain objects is carried out according to the following principle:

- the terrain object class is determined;
- the terrain object subclass, species, subspecies, etc. is determined in accordance with the classifier of terrain objects, i.e. types of terrain objects in the ontology;
- the attributes and characteristics that are inherent in this terrain object class are determined;
- the values of the characteristics for this object class are determined;
- the homonymy of identification is eliminated;

- appropriate connections are established between the map object, the concept in the knowledge base with the established geosemantic elements;
- spatial relations are established between terrain objects assigned to certain classes.

CONCLUSION

Let us list the main provisions of this article:

- the development of geoinformation systems consists in their intellectualization, thereby expanding the range of applied problems using knowledge about terrain objects;
- it is proposed to consider the map as an *information construction*, the elements of which are *terrain objects*, thereby ensuring the structural and semantic interoperability of geoinformation systems due to the transition from the map to the semantic description of map elements, that is, terrain objects and connections (spatial relations) between them;
- ensuring semantic interoperability is achieved through the development of ontologies of subject domains, and the establishment of *geosemantic elements* allows setting spatial characteristics of terrain objects;
- availability of a particular *Technology for intelligent geoinformation systems design* provides the process of designing intelligent geoinformation systems built on the principles of ostis-systems.

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Поддержка жизненного цикла интеллектуальных геоинформационных систем различного назначения

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Работа посвящена частной технологии проектирования интеллектуальных геоинформационных систем, построенных по принципам ostis-систем. Структурная и семантическая интероперабельность геоинформационных систем, построенных по предлагаемой технологии, обеспечивается за счет перехода от карты к семантическому описанию элементов карты.

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Ensuring Information Security of the OSTIS Ecosystem

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***Abstract*—The development of artificial intelligence systems, associated with the transition to working with knowledge bases instead of data, requires the formation of new approaches to ensuring information security systems. The article is devoted to the review of approaches and principles of ensuring security in intelligent systems of the new generation. The current state of methods and means of ensuring information security in intelligent systems is considered and the main goals and directions for the development of information security ostis-systems are formed. The information security methods presented in the article are extremely important when designing the ostissystems security system and analyzing their security level.**

***Keywords*—information security, new generation intelligent system, Information security threats**

I. INTRODUCTION

A wide variety of information security models, the growing amount of data that needs to be analyzed to detect attacks on information systems, the variability of attack methods and the dynamic change in protected information systems, the need for a rapid response to attacks, the fuzziness of the criteria for detecting attacks and the choice of methods and means of responding to them, the lack of highly qualified security specialists entails the need to use artificial intelligence methods to solve security problems.

II. THE SPECIFICS OF ENSURING INFORMATION SECURITY OF INTELLIGENT SYSTEMS OF A NEW GENERATION

Information security of intelligent systems should be considered from two points of view:

- application of artificial intelligence in information security;
- organization of information security in intelligent systems.

The use of artificial intelligence in information security

Artificial intelligence is actively used to monitor and analyze security vulnerabilities in information transmission networks [1]. The artificial intelligence system allows machines to perform tasks more efficiently, such as:

- visual perception, speech recognition, decision making and translation from one language to another;
- invasion detection - artificial intelligence can detect network attacks, malware infections and other cyber threats; systems.
- cyber analytics - artificial intelligence is also used to analyze big data in order to identify patterns and anomalies in the organization's cyber security system in order to detect not only known, but also unknown threats;
- secure software development - artificial intelligence can help create more secure software by providing real-time feedback to developers.

Artificial intelligence is used not only for protection, but also for attack, for example, to emulate acoustic, video and other images in order to deceive authentication mechanisms and further impersonation, deceive checking a person or robot capcha, etc.

Currently, it is possible to define the following classes of systems in which artificial intelligence is used [2]:

- UEBA (User and Entity Behavior Analytics) — a system for analyzing the behavior of subjects (users, programs, agents, etc.) in order to detect nonstandard behavior and use them to detect potential threats using threat templates (patterns);
- IP (Threat Intelligence Platform) — platforms for early detection of threats based on the collection and analysis of information from indicators of compromise and response to them. The use of machine learning methods increases the efficiency of detecting unknown threats at an early stage;
- EDR (Endpoint Detection and Response) — attack detection systems for rapid response at the end points of a computer network. Can detect malware, automatically classify threats and respond to them independently;
- SIEM (Security Information and EventManagement) — systems for collecting and analyzing information about security events from network devices and applications in real time and alerts;
- NDR (Network Detection and Response) — sys305 tems for detecting attacks at the network level and promptly responding to them. AI uses the accumulated statistics and knowledge base about threats;
- SOAR (Security Orchestration and Automated Response) —systems that allow you