- analysis problem and services provided by numerous sources of *geoinformation*;
- implementation of knowledge output using spatial and thematic information as components of *knowledge* about *terrain objects* using the Question Language;
- implementat ion of a *cartographic interface* in *intelligent ostis-systems* as a natural way for a human to represent information about *terrain objects*.

The constant evolution of models and means of ontological description of subject domains, using spatial and temporal components, their heterogeneity, and ambiguity, poses new challenges in terms of interaction, integration, and compatibility of various applied systems due to:

- the integration of *subject domains* and their corresponding ontologies (vertical level);
- expanding the functionality of the systems using reusable components of these systems (horizontal level), in particular, designing components for new territories and/or in a new time interval.

In order to implement the requirements represented, it is proposed to consider the map as an *information construction*, the elements of which are *terrain objects*, and to offer:

- *the Subject domain and ontology of terrain objects*;
- *Map Language Syntax*;
- *Denotational semantics of the Map Language.*

The transition from maps to their *meaning* is based on:

- the formal description of the Map Language Syntax;
- the formal description of the Denotational semantics of the Map Language.

At the same time, *semantic compatibility of geoinformation systems* and their components are provided due to the common ontology of *terrain objects*, which is necessary for the interoperability of *geoinformation systems* for various purposes and their components.

Thus, structural and semantic interoperability of geoinformation systems is ensured due to the transition from the map to the semantic description of map elements, that is, terrain objects and connections (spatial relations) between them.

The presence of these circumstances determines the existence of a scientific and technical problem of intellectualization of geoinformation systems and the creation of the Technology for intelligent geoinformation systems design, which are based on the principles of designing ostis-systems.

III. SYSTEMATIZATION OF PROBLEMS SOLVED BY INTELLIGENT GEOINFORMATION SYSTEMS

One of the ways to increase the efficiency of using information and computing tools is *intellectualization of geoinformation systems.*

Intellectualization of geoinformation systems implies:

- the possibility of end-user communication with the system on the *Question Language*;
- the use of various interoperable problem solvers with
- the use of *cartographic interface* to visualize the source data and results. the possibility of explaining the solutions obtained.

The implementation of the capabilities of *intelligent geoinformation systems* can be carried out using:

- *knowledge base* management systems;
- multimedia *knowledge and databases* by application areas;
- interoperable *problem solvers*;
- an intelligent *cartographic interface*;
- *expert systems* in various fields of human activities;
- *decision support systems*;
- *intelligent assistance systems.*

Intellectualization of geoinformation systems involves solving the following problems:

- the use of digital cartographic material and data from *remote sensing of the Earth* in problem-oriented areas [2];
- planning actions in a dynamically changing situation in conditions of incomplete or fuzzy data using expert knowledge [3];
- analysis of emergency situations and preparation of materials for decision-making on prevention or elimination of their consequences;
- creation of decision support systems for applied *geoinformation systems* of territorial planning and management [4];
- development of diagnostic expert systems for geological exploration activities with remote access to them;
- logistics planning, creation of expert systems and enterprise management software;
- creation of control and navigation systems;
- creation of *expert systems* for forecasting the occurrence and development of technogenic and natural situations: floods, earthquakes, extreme weather conditions (precipitation, temperature), epidemics, spread of radionuclides, chemical emissions, meteorological forecast, etc.;
- creation of *expert systems* for the selection of terrain compartments for the construction of various objects;
- creation of *expert systems* for planning the efficient use of agricultural land;
- creation of *expert systems* and software tools for geodata analysis;
- creation of image and picture recognition systems based on data from *remote sensing of the Earth*;
- creation of banks of digital cartographic information with means of remote access to them;
- image processing;
- retrospective analysis of events (see [5], [6];