1) Railway lines and stations: This subject area describes information about various railway lines, including their geographical location, length, speed limits, track types, and accessibility. It also includes information about stations, including their location, capacity, and cargo and passenger handling capabilities.
2) Cargoes and containers: This subject area describes various types of cargoes and containers, their characteristics (weight, volume, type of packaging), processing and storage requirements. It also includes information about special requirements for certain types of goods, for example, goods requiring special transportation conditions (temperature conditions, vibration protection, etc.).
3) Schedule and Train Timetable: This subject area describes information about the train timetable, including departure and arrival times, intermediate stops, travel speeds and possible overlaps on the track. It also includes information about the regularity and repeatability of the train schedule.
4) Resources: This subject area describes information about available resources such as locomotives, wagons, personnel, and technical equipment. It includes the characteristics of resources (load capacity, technical parameters), their availability and maintenance schedule.
5) Laws and Regulations: This subject area describes the laws, rules and regulations governing railway logistics. It includes safety rules, standards for the transportation of certain goods, requirements for staff working hours, rules for the priority of train traffic and other regulatory information.
6) Monitoring and Data collection: This subject area describes the monitoring and data collection systems used to obtain information about the current state of railway logistics. It includes data on train movement, cargo status, information about delays and other factors affecting planning and management.

Various problem solvers can be used to automate transportation planning and management. Here are some typical problem solvers that can be applied in this field:

1) The routing problem solver: This solver allows you to optimize train routes, taking into account various factors such as schedules, availability of railway lines, cargo requirements and restrictions on infrastructure and transportation conditions. It helps to choose the best routes, minimizing the time and cost of transportation.
2) Train timetable development solver: This solver allows to optimize the train timetable, taking into account the timetable, passenger and cargo requirements, infrastructure constraints and other factors. It helps to allocate trains by time and resources,
3) Loading planning problem solver: This solver helps to optimize the loading of wagons, taking into account the characteristics of goods and limitations of wagons, such as load capacity, dimensions and special requirements. It helps to maximize the loading of wagons, minimizing empty runs and improving the use of the wagon fleet.
4) The solver of the optimal resource planning problem: This solver allows you to optimize the allocation of resources such as locomotives, wagons, personnel and technical equipment to ensure the efficient operation of the railway system. It takes into account transportation requirements, traffic schedules and resource constraints, helping to achieve optimal use of resources and reduce costs.
5) Demand Forecasting and Planning Solver: This solver is used to predict the demand for rail transportation, taking into account various external factors such as economic conditions, seasonality, trends and others. It helps to plan capacity and resources to meet demand and prevent congestion or lack of transportation capacity.
6) Monitoring and Management Problem Solver: This solver is used for continuous monitoring and management of railway transportation. It analyzes data on train movements, traffic status, delays and other events, allowing you to make operational decisions and respond to changes in real time.

These are just some examples of problem solvers that can be used to automate the planning and management of railway logistics. The specific set of solvers will depend on the specific requirements and characteristics of the railway logistics system, as well as on the goals and constraints set. Using ontology for these problem solvers in the field of railway logistics can bring several advantages:

1) Knowledge structuring: Ontology allows you to structure knowledge about the main subject areas of railway logistics, such as infrastructure, resources, cargo and schedules. This facilitates the understanding and organization of information, simplifies its accessibility and exchange between different systems and participants.
2) Data unification and standardization: An ontology defines common semantics and standards for data representation in railway logistics. This allows different systems and applications to use the same terms and data formats, which ensures consistency and compatibility of information. This is especially important when integrating different systems and exchanging data between them.
3) Improvement of planning and optimization: Ontology provides a formalized domain model on the basis of which planning and optimization algorithms can be developed. The use of ontology makes it possible to take into account various limitations, requirements and

dependencies between different aspects of railway logistics. This contributes to more efficient use of resources, route optimization and improved service quality.

4) Decision Making Improvement: Ontology can be used in decision support systems, providing a semantic model and context for data analysis and recommendation generation. It allows systems to identify dependencies and relationships between various factors, to carry out forecasting and scenario analysis, which helps to make reasonable and informed decisions.
5) Ease of expansion and modification: Ontology provides a flexible and extensible domain model that can be easily modified and supplemented as needed. This allows you to adapt the ontology to new requirements, changing conditions and expand its functionality. This flexibility makes it easier to support different types of tasks and to develop the system in the future.

In general, the use of ontology for data solvers in the field of railway logistics contributes to improving data organization, information compatibility and consistency, optimizing planning and management processes, as well as making informed decisions based on data analysis.

The ontology for these problem solvers in the field of transportation process management should be flexible and modular in order to take into account various factors and adapt to changing conditions.

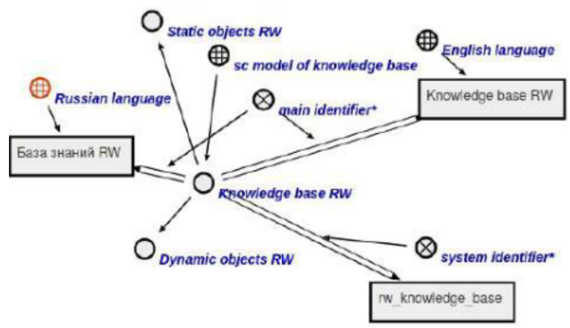

Figure 2: Semantic neighborhood of knowlegebase RW

Within the framework of this work, a top-level ontology is implemented describing the main objects of the transportation process, examples of objects of which are presented in Figures 2-4 in the form of an SCg code [10].

V. Conclusion

Thus, within the framework of this work, the relevance of developing an ontology for an intelligent transportation process management system has been determined.

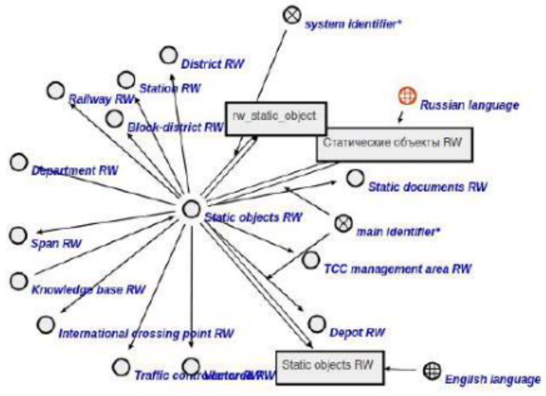

Figure 3: Semantic neighborhood of knowlegebase RW

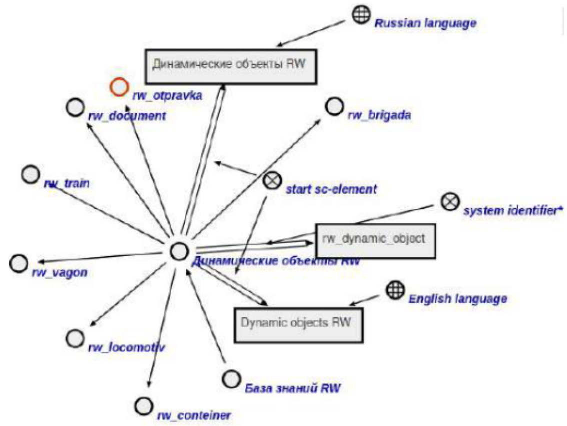

Figure 4: Semantic neighborhood of static objects RW

The structure of the theory of ontology construction is given. The existing ontologies of railway systems are described. The problems of existing ontologies are established. It is proposed to use a process-object approach in the formation of ontology. Examples of the use of ontology are given. It is indicated that the OSTIS technology is an effective tool for describing the process- object ontology of the transportation process. The top- level ontology for the Belarusian Railway has been implemented.

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ОСНОВЫ ОНТОЛОГИИ ПЕРЕВОЗОЧНОГО ПРОЦЕССА НА ЖЕЛЕЗНОДОРОЖНОМ ТРАНСПОРТЕ

Ерофеев А. А., Ерофеев И. А.

Определена актуальность разработки онтологии для интеллектуальной системы управления перевозочным процессом. Приведена структура теории построения онтологии. Описаны существующие онтологии желез- нодорожных систем. Установлены проблемы суще- ствующих онтологий. Предложено при формировании онтологии использовать процессно-объектный под- ход. Приведены примеры использования онтологии. Указано, что эффективным инструментом описания процессно-объектной онтологии перевозочного про- цесса является технология OSTIS.

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