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Cognitive Information Retrieval Based on Ontological Model of Knowledge Representation

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The technologies of information retrieval in a database with full-text semantic indexing are considered. The information retrieval process is considered as a cognitive-oriented process. The semantic image of the document context is presented as an ontology. An ontology is defined as a set of three interconnected systems (functional, conceptual and terminological), on which the operation of comparing elements of different systems at the level of signs is defined. A functional system (a system of tasks, objects, processes, properties of the subject area) represents objects and situational relationships between them in the context of the target activity. The objects of the conceptual system are stable concepts, and the set of relationships is limited to generic and associative relationships. The terminological system reflects the properties of a natural language at the level of signs –terms for which relationships of equivalence and inclusion, as well as linguistic relationships, are specified. The semantics of the document are represented as a multi-meta-hyper-graph of the ontology. Such graph in the nodes contains named entities (concepts, names, values, etc.), and in the edges –typed relationships, extracted from the text also taking into account the location of them. This made it possible to build up mechanisms (algorithms) for a new type of information retrieval –searching semantic dependencies and neighborhoods within the text of a document or a selection of documents. Such cognitive information retrieval is considered as a search for a path on a multi-meta-hyper-graph of an ontology dynamically formed on the basis of ontological images of found documents or their fragments. A Cognitive subject tree is used to fix and manage search directions. A Cognitive subject tree is a hierarchically ordered structure of a personified representation of a subject area (project, task). Such a structure integrally identifies tasks / knowledge, since each structural and semantic component (node) of the tree includes not only keywords, but also relevant documents texts, query expressions, indexes of classifiers, etc. The prototype of the information retrieval system has been developed and experimental databases have been created.

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