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Semantic Aspects and Problems of Knowledge Transfer

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ABSTRACT: This study aimed to determine the role of semantics in knowledge transfer and in the many platforms related to knowledge management. *This* study focuses on the semantic aspects of knowledge transfer *and* the role of cognitive technologies in knowledge management and cognitive *phenomena*. Another aspect of research is the different models for *evaluating* knowledge and related problems *in* the areas of semantic technologies and knowledge assets, *and* the emergence of new concepts. Given the quantitative nature of semantic analysis, it is a very important factor in the process of converting data into information and *then creating* useful knowledge as a part of every knowledge management architecture. We also describe some problems and difficulties from a semantic *perspective* related to transferring knowledge to business and society.

KEYWORDS: semantic information, knowledge transfer, cognitive technologies, knowledge problems, semantic analysis, knowledge management

INTRODUCTION

Knowledge domains are built primarily to represent data and processes in semantic structures so that users can obtain information for various purposes, for example, availability of cognitive platform resources, location of people, business processes, and available useful knowledge in organizations.

The communication characteristics of the system are important because they allow for the representation of knowledge and data support for decision-making. This implies the introduction of methods for active knowledge research, such as semantic systems, object ontologies, and data interpretation programs. Several years ago, technologies such as “rich data” and information integration tools were introduced, which are currently undergoing significant transformations.

In the modern world, the combination of the information domain, “big data” and the knowledge domain with new information-communication and intelligent technologies, as well as the open type of innovation, guarantees the development, success, and competitiveness of business, public institutions, and administration. Experts involved in knowledge processing need to spend more time thinking and developing new ideas than analyzing incoming data and information. When comparing knowledge and information, the essential differences are summarized in the following main points: information can be reproduced by the final recipient, thanks to information technologies, while with knowledge, complete identity of versions is not possible; in the transfer of knowledge and information, the latter can be easily transmitted, and the assimilation of knowledge requires long-term training and experience. A difference can be found in predicting future processes, as information about problems is not sufficient to make adequate forecasts; predicting what would happen in a certain development of the situation is possible for someone who has mastered knowledge in a specific area. Knowledge management approaches address the challenges of managing complex, information-driven environments. Recently, this technology has often been categorized as a science of complexity.

From the semantic and cognitive competence perspective, researchers Marconi and Umberto Eco (Eco, Umberto. Kant and Platypus (2004) speak of double lexical competence (inferential and referential). According to Eco, the second type can be divided into three different groups: instructions for recognition, identification, and finding the object, which are especially important functions in systems based on machine intelligence and platforms for the automatic visualization of information.

The cognitive environment of a given individual is the set of facts that appear to him as inferences and refer to the effort to make our cognitive environments socially compatible. However, this is not the only problem. Another problem is that elementary statements are confused with texts. Textual semiotics has long recognized that one can discover systems of conventions at the grammatical level and still accept that negotiations occur at the textual level. There is already a phenomenon that could serve as a model for the perfect reason and strict designation. We may not know at all what properties the recipient has, but we know that

this name (address) indicates (through a chain of electronic phenomena that we need not analyze in detail, but whose effectiveness we witness every day) an individual entity that can be distinguished from any other, regardless of our beliefs, opinions, lexical knowledge, and the knowledge we have about the way the name "points" to the entity. All impossible objects are inconceivable, but not all inconceivable objects are impossible. For example, an infinite universe is beyond our ability to imagine, but it is not impossible in principle. Just as there are perceptual ambiguities, there are cognitive and referential ambiguities.

Eco (Umberto, 2004) believes that cognitive types imply four transitions: stimuli (what we now call the object itself), transformation (the work done on the design), perceptual model, and semantic model. From what has been said so far, the cognitive type should now fulfill the dual function of the two "models" - the perceptual and the semantic.

ARTIFICIAL INTELLIGENCE - SEMANTIC PROBLEMS

Another area of artificial intelligence is finding ways to integrate knowledge into machines. The problem here is how to find the knowledge we need, learn how to represent that knowledge, and finally, develop a process to evaluate the effectiveness of our knowledge.

Eco (Umberto and Artificial intelligence,2016) many times discussed some of the problematic aspects of artificial intelligence, speaking about the correspondence between sign and reality when linguistics and philosophy had not yet realized the arbitrariness of signs. In fact, the problem of the ideal language can be understood as an introspection of the symbolic function, which is limited by analogical and emblematic associations in the language. The French Encyclopedia may be the concrete product of the construction of these semantic networks, but in terms of their universal dissemination, Eco acknowledges that "all artificial intelligence projects somehow inherit the a priori problem of artificial languages," without deepening the problem and further admitting that artificial intelligence produces only limited or spontaneous results. In the concept (Bolo, Jacques, 2016) for "machine person" it is noted that AI or robotics are in the same situation as humans when it comes to information. This is the denial of reflective consciousness in favor of an innate intention. We must not forget that the external programming of a machine, often limited to experimental microworlds, corresponds to human thinking. In addition to the external programming of all learning, opponents of AI refuse to allow rules to be explicit when describing a person, denying the criterion of a means–end relationship.

Characteristics of semantic information

Information is recognized as one of the most important resources that people can use effectively to increase their knowledge in the information age. Useful information can include three important parts: syntactic, semantic, and pragmatic. The semantic part of information is of utmost importance when making decisions in a problem situation to avoid negative effects for citizens. On the other hand, if we consider the concepts in information sciences, the levels of information can be classified as follows: statistical: the lowest level of information, the only thing that is required is to know how to calculate; syntactic-the information is structured, it is based on certain rules; there is a way to record it, but before recording it, it is necessary to master the rules of syntax; semantic- it includes the meaning of the information, that is this type is not only structured information, but it has meaning and is of a more complex magnitude; pragmatic- oriented towards performing actions that correspond to the meaning of the information, all pragmatic information that exists in the world is created by man; approbative- it is related to the set goals and is oriented towards achieving the results of the information. It can be said that information is a complex quantity, measuring information means measuring complexity. The network of possibilities almost always offers different degrees of complication of the situation, arranged from the simplest to the most complicated cases. The more complex the problem we calculate, the more time and space it takes to implement the algorithm necessary to solve the problem. Specific and nonspecific information can be defined as follows: the update of a possibility is specific, and the possibility depends on the samples used. Non-specific information is the opposite of specific information. Semantics also includes concepts such as object information, also called ontological information, as this type of information relates to a specific object and is defined as "a network of states" where this object exists and the structure/characteristics that vary in this state. Ontological information is defined by the object and has no relation to the subject, as the object and ontological information are used in parallel. The successful important elements during the analysis of information are calculated by the source of information, information capacity of the channel, and encoding and decoding of both the source and the channel. For example, Shannon's information theory is considered a static theory of syntactic information, not a theory of information in general. In addition to this theory, there are other similar developments related to algorithmic information theory and combinatorial information theory. In quantum information theory, the role of entropy introduced by Neumann is as follows: first, the quantum information content present in words or texts is measured. That is, in general, the number of qubits required to encode the message without losing information can be calculated. Second, it allows us to measure the traditional information content encoded in words; from this point of view, we can find the maximum amount of information contained in the

bits when reconstructing the message. Third, the entropy introduced by von Neumann is used to quantitatively calculate the entanglement of particles in a purely mixed state.

The classical theory of semantic information (Marinov Rusi, 2021) began with the work of Rudolf Carnap and the Bar-Hillel framework and was developed in the 1950s. These two scientists developed an ideal model for a language related to this type of information. The language contains the following important symbols: " n "-a finite positive number and " k " another similar number (both numbers represent noun names). Additionally, a verb is introduced in the form of " have or be." If "a" is a noun and "P" is an adjective, then "Pa" is considered as "a has the quality P," or "a is P".

There are two shortcomings in this theory: one is related to the ideal model of language, which is very far from natural, real language; the second is that theory is concerned only with quantitative measurements of semantic information and is not interested in the essence of information and meaning. Pragmatics is formed depending on the subject's experience. Semantics are abstract by nature and cannot be created through sensory agents. It can be generated using both syntactic and pragmatic values, combining both and transforming them into semantics, and then naming it. From the perspective of information ecology, the limitations of semantic information should also be considered. In the fourth case, the theories of Shannon, Wiener, and Bertalanffy are influential. The latter considers information to be an important characteristic of system complexity.

Semantic analysis and knowledge

Knowledge for solving problems is determined by intuition, imagination, inspiration, and aesthetics. It depends on our ability to acquire, process, and understand information and search for meaning and apply it. From this perspective, artificial intelligence can be defined as intelligence integrated by a person into a machine based on knowledge and is strongly dependent on the semantic type of information. Semantic information plays an important role in knowledge construction and intelligence studies.

In the major book of British scientist Roger Penrose (Penrose, Roger. 2020) related to artificial intelligence is that "the physical functioning of the brain gives rise to consciousness, and this functioning cannot be adequately simulated by computational processes." A material basis for the phenomenon of awareness that is not amenable to computational simulation would explain the non-computational nature of "understanding." From this, the following dependencies are obtained:

a/ "intelligence requires "understanding"

b/ "understanding" requires "awareness"

Penrose believes that the mechanisms underlying our intelligence are "unknowable," which is not very helpful for those hoping to build a truly artificially intelligent robot. Our conclusion should not be, Penrose argues, that the laws underlying intelligence are incomprehensible but that they are incomputable. Penrose also suggested that for some classes of problems, quantum computation outperforms Turing computation in terms of computational complexity theory.

According to Mehdi, Brandt, Roshchin and Runkler (Mehdi Gulnar, Brandt S., Roshchin, T. Runkler, 2016) one of the big challenges in knowledge management is to find knowledge and information that is relevant, and here ontologies have a lot of potential. The following are the significant weaknesses of current knowledge management systems: searches often ignore context in the current knowledge system. Applications today provide keyword-based search functionalities that often retrieve irrelevant information when terms have different meanings in different contexts or fail to relate different pieces of information into a meaningful context; inefficient access and integration of information is a major challenge in current systems. Human browsing and reading are required to extract and integrate information from various sources. In existing systems, automatic agents do not integrate and do not possess the basic knowledge required to extract information from heterogeneous sources; maintaining knowledge is the main point of the state-of-the-art. It becomes a difficult and time-consuming activity when the knowledge repositories become large or reach the level of Big Data infrastructures. The lack of shared understanding is another aspect that involves how people, organizations, and knowledge management systems communicate with one another. However, resolving these issues is problematic from a technological perspective.

Semantic analysis includes several important aspects, such as the context surrounding words, phrases, and terms, retrieval of relevant information to the object, and comparison of new information with prior experience, as well as taxonomy in the case of machines. Typically, in AI technology semantic analysis involves (Kanade, Vijay 2022): data processing; defining features, parameters, and characteristics of processed data; data representation; defining grammar for data analysis; assessing semantic layers of processed data; performing semantic analysis based on the linguistic formalism. However, all these techniques are related to data and exclude the semantic form of information. Semantic analysis is a crucial step in Natural Language Processing (NLP) that focuses on understanding the meaning of words, phrases, and sentences in each text. The key steps involved in semantic analysis are lexical analysis, syntactic analysis, and semantic interpretation. Despite significant progress, semantic analysis still faces challenges, such as ambiguity, context, idioms, and metaphors. This means that understanding the context in which text is used is crucial for accurate semantic analysis, but from another point of view, it can be challenging to capture all relevant

contextual information. Creating semantic dictionaries or vocabularies connected with the processes typical for organizations, businesses, and technologies is the first task to do in resolving some problems during the analysis.

The main objectives of the semantic analysis module in the platform proposed by Liu, Yi Yang, Deli and Wang (Liu Yi, Yang Deli and Wang Yu, 2014) are to complete the semantic analysis of sorted pages and transmitting them to user in decreasing order according to their relevance to the user query. The module comprises three types of agents.

• Coordinator Agent. The coordinator has two tasks: assigning each word-to-word agent and rearranging the retrieved webpages.

• Word Agents. These agents perform semantic analysis of text with a given criterion.

• Morphological analysis agent, syntactic analysis agent, and semantic analysis agent. The three agents provide support for the three stages of semantic analysis.

The presented elements of the knowledge platform are very smart, but there are many important things that are missing in the module related to measuring complexity, context, transformation, and ontological aspects of information.

CONCLUSION

The semantic processing of information and knowledge structured in semantic terms leads to a series of problems in the machine processing of the vast flow of data related to the knowledge management platforms and architectures in the area, don't mention a various intelligent programs. It is almost impossible to transform semantic information with machines into knowledge. This is a serious challenge for contemporary experts and from this point of view it is needed to include special semantic dictionaries developed by people involved in the science of semantics. It is important to find out that this study is inspired by the semantics of knowledge and proposes a series of recommendations in this complex area.

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