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A New Understanding of the Philosophy of Knowledge

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Abstract*— Artificial intelligence systems require computer models and software beyond those currently available. Modern forms of information presentation still do not allow semantic modelling of complex textual information. When solving clustering or classification tasks, machine learning treats a set of data as knowledge. We work through the spoken language syntax of symbols, single words, or different types of literals, which is why machine translation approaches are still far from perfect. Computers are still unable to accurately translate from one language to another. Existing models of knowledge representation are only a first-order approach to the natural. The main essence of our approach lies in the fact that information should be considered in an immaterial aspect, in a quantum form, in the form of a continuous hologram. What we call information is only its material reflection. When processing textual information, Our communication is often based on single words, symbols, or various types of literal expressions. That is why this article is dedicated to a new understanding of knowledge representation and acquisition, which can become the basis for working not only on simple textual information, but also on high-level knowledge and knowledge models, and thus the beginning of a new paradigm of artificial intelligence.

Keywords*— artificial intelligence, informational exchange, knowledge representation, quantum information, thinking model.

I. INTRODUCTION TO THE PROBLEMATICS

Human existence fundamentally relies on the exchange of information with our surroundings. Information itself cannot be directly perceived; rather, we process its material representations through our brains, interpreting them after perception. For instance, a math textbook, though filled with information, cannot solve even a basic math problem on its own. Similarly, the way we comprehend the information from our smell or taste receptors can be illustrated through graphs that represent the molecular structures of substances. This article explores new perspectives on how knowledge is represented and acquired. The field of machine translation, although advancing, is not yet perfect; a computer still struggles to translate accurately between languages. Currently, search engines use only a basic form of natural language, relying on symbols, single words, or various types of literals. In machine learning, data sets are treated merely as knowledge for tasks like clustering or classification. [1,2]. One of the reasons for this is that modern computers are not at all like the human brain. Existing models of knowledge representation (semantic networks, framework systems, etc.) are only a first-order approach to the natural one.

II. INFORMATION ASPECTS

The idea of information encompasses various aspects including data, different levels of knowledge, intelligence, and awareness, among others. In discussing these elements, contemporary information technology employs concepts such as epistemology, ontology, taxonomy, entropy, and more. The theory of knowledge conceptually uses the term *ontology* as a model for describing knowledge. As for *taxonomy*, it is the science of naming, describing and classifying organisms.

In general, the hierarchical gradation of information as an embedded hypergraph system (like a "nested dolls") is related to its *complexity*, which determines the quality of the information dimension and the variety of components in terms of modelling. On the other hand, from the point of view of geometry, we can consider information, that is, some content contained in a spatial form (in Greek, "in form" means what is in the form). Therefore, any level of semantic information can be associated with complex geometric objects or hypergraphs (e.g. complex organic molecules, neural networks or ensembles, etc.) [3].

The idea of information is closely linked to *entropy*. In nature, every event involves shifts in entropy, either increasing or decreasing. This connection has inspired numerous models that incorporate entropy, including Shannon's information theory, synergy, and complexity theory. Conversely, evolution represents an increase in information, which in thermodynamics contrasts with entropy as it aligns more with synergy, and in the realm of consciousness, it encompasses syntactic, semantic, and pragmatic aspects.[2]

Quantum view of information. The main quintessence of our approach is that we should consider information in an immaterial aspect, in quantum form in the form of a continuous hologram. **What we call information is only its material reflection.** Quantum entanglement, a term introduced by Erwin Schrödinger and a fundamental aspect of quantum physics, describes the unique correlations found between parts of a quantum system. Schrödinger described entanglement as a defining trait of quantum mechanics. An example of this phenomenon can be seen in entangled states of pairs of two-state quantum systems, or qubits, which exist in the basic states |0) and |1. The behaviour of these systems is governed by the Schrödinger equation, which is a core dynamic law in quantum mechanics. The process known as decoherence describes how a quantum system transitions into a classical state. The universe exhibits dynamic and bipolar characteristics due to quantum dualism, or its antipodal nature. This quantum bifurcation into two opposing forces drives universal dynamics, embodying the superposition of Chaos and Cosmos. Every entity, whether substantive or phenomenal, inherently exhibits pluralism, that is, it exists simultaneously in any system of dimensions, but it can only be recognized epistemologically. Furthermore, every substance (including information) and phenomenon is a discrete decoherent materialization of quantum entangled uncertainty [5].

III. THE HIERARCHICAL REPRESENTATION OF KNOWLEDGE

Numerous models are employed to depict knowledge, such as predicate logic (first-order logic), type theories (higher-order logic), semantic networks, frames, scripts, production rules, ontologies, and knowledge graphs[6]. Knowledge continuously evolves through the use of multilevel ad hoc hypergraph fractal systems and epistemological topological transactions throughout a lifetime.

In this article, we have chosen to focus on the graphical model of knowledge representation due to our research interests. In human consciousness, knowledge and thinking are intertwined, influencing the quality of information processing and logical reasoning based on the knowledge at hand. In the subconscious, knowledge manifests through a system of instinctive stereotypes. The universal principle of fractal structurogenesis is effectively applied to the hierarchical structure of the knowledge system, where each level enhances the quality of the system's subsequent dimensions. It is understood that the bit is the smallest unit of information, which forms an ascending fractal structure within a knowledge system, comprised of relevant epistemological layers. (Figure 1).

A discussion of knowledge formation is possible only at the lower levels of knowledge representation since modelling high-level meta-awareness and thinking is beyond human imagination. The volume of information within the knowledge system expands through hierarchical levels based on the degree of dimensions. At the base level, individual letter-sounds combine to form thousands of words, which then lead to the generation of numerous ideas and knowledge at higher, macro levels. Any information in the brain through axon-dendrite synapses is realized as semantic graphs (or hyper graphs) [7].

The evolutionary process of knowledge is generally an ascending process in a hierarchy, where the transition to a higher level occurs only after the formation of a lower level. As a result of the self-assembly of fractal structures, knowledge can be more complexly formed from micro-knowledge to macro-knowledge. This procedure is carried out by entropy minimization criteria. All levels of knowledge can be considered complete when its entropy becomes zero, and while the learning process itself continues with additional information, knowledge is still incomplete [5].

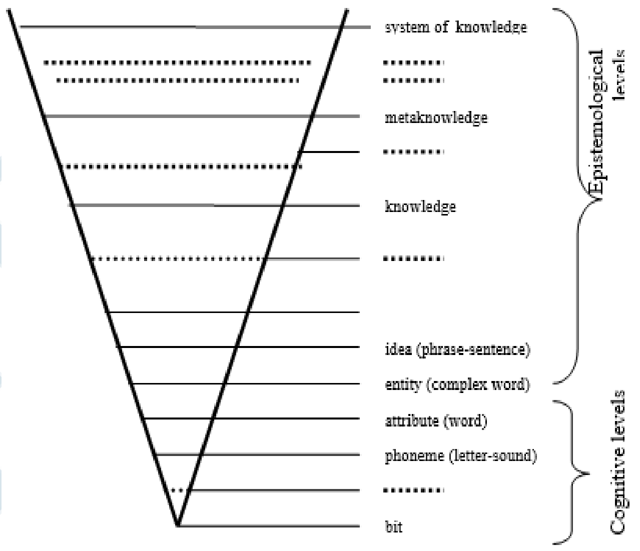

Figure 1

Each unit of the real world received through sensory channels is associated at the micro level with attributes perceived in consciousness, which form a corresponding unique neural network, that is, it contains an ontological model of a semantic unit in the brain. They do not depend on any verbal aspect. This principle is repeated at all epistemological levels of the knowledge system. Neuron graphs, as the so-called Virtual "macro neurons", at the next level of the knowledge system, form synergistic groups of neurons with different configurations. Therefore, drawing on fractal principles, epistemological layers of foundational knowledge at various dimensional levels integrate into a cohesive system of knowledge as a whole. The familiar model of knowledge represented in the brain's neural networks no longer aligns with the current model of artificial knowledge, much like high-dimensional supergeometry does not conform to linear or two-dimensional geometry. At present, all existing methods represent merely the initial attempts of artificial intelligence to mimic natural intelligence. Consequently, it is crucial to develop a new generation of artificial intelligence that relies on a novel paradigm of knowledge representation. [8,9].

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IV. THE HUMAN BRAIN AND KNOWLEDGE

In the process of developing artificial intelligence, artificial neural networks are considered by some scientists to be analogous to the human brain, which is wrong. Its accessories and principles of performance have nothing to do with the structure and principles of operation of the brain. There is no processor, no ROM or RAM, etc. in the brain. The brain solves many functionally different tasks simultaneously. The brain manipulates complex virtual geometric objects through neural ensembles rather than formalisms [10]. Unlike a computer, there are no cycles, random selection, or mathematical calculations in the brain. The brain is a high-dimensional, highly complex logical machine that operates on an analog or continuous principle. At the embryonic stage, the brain is supplied with a large number of neurons that function throughout life. The difference is in the topological complexity of a flexible, constantly reconfigurable, i.e. dynamic neural (synaptic) network.

In the hierarchy of knowledge representation, models differ across levels. Furthermore, distinctions are made between external representations of knowledge and internal (real) models. The actual model, functioning within the hierarchical structure of the brain's neural groups, remains hidden from us, while the external representation is clear and well-defined, organized into linguistic and ontological categories. For example, when we think of any word or concept as a specific series of phonemes (strings), it constitutes an ontological "atomic" model that incorporates relevant attributes acquired during language learning. (Fig.2), then, when this sequence is read or heard in a particular language, it connects consciousness to this model. For example, the words "table," "стол," and "მაგიდა" represent the same ontological model universally, yet they are recognized only within the context of a specific language. This recognition is further complicated by the presence of synonyms and homonyms in linguistics. [10].

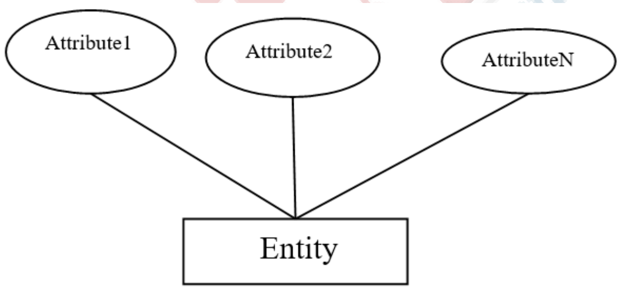

Figure 2

A single detail can significantly change the ontological model. Consider, for example, two words composed of the same letters but arranged differently: "მთა" ("mountain") and "თმა" ("hair"). Even though they share the same letters, their arrangement leads to entirely different ontological models, each with its own unique set of attributes. This demonstrates that in any given language, the order of letters, not just their combination, is crucial. When we encounter a specific word in its native language, our brain activates a neural centre with its internal model, which is universal—implying that it operates independently of any specific language and is shared across all humans.

Thus, at the micro level, any real-world entity—be it a subject, event, or other object is linked to attributes perceived in consciousness. Its unique ontological model resembles a star-shaped neural structure, independent of any linguistic characteristics.

A sequence of words is structured to create the next phrase-sentence level. Each idea (phrase-sentence) is described in the form: *(⟨subject, predicate, object⟩, time)* also known as semantic triples. The event is identified by the subject, and its properties are described by the predicate and object. A timestamp can be included to capture the timing or dynamics of the event [10].

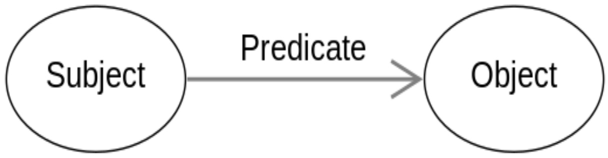

Figure 3

An ontology provides a formalism for representing knowledge, each component of which is related to the next component through attributes. The degree of connection between entities can be characterized according to the compatibility between their attributes, or "semantic synapse", which is described by probability. Every idea (phrase or sentence) or concept is characterized by a "criterion of integrity," which depends on the semantic compatibility or synergy among its elements. Typically, in the depiction of knowledge, particularly during the process of knowledge creation, synergy is considered the antithesis of entropy.

At the subsequent level, a sentence functions as a unit (node), creating the basic graph that embodies micro-level knowledge. The knowledge model at the macro level is seen as a semantic macro unit, which then leads to a hypergraph of meta-awareness, progressing upward through the hierarchy's advanced layers [10].

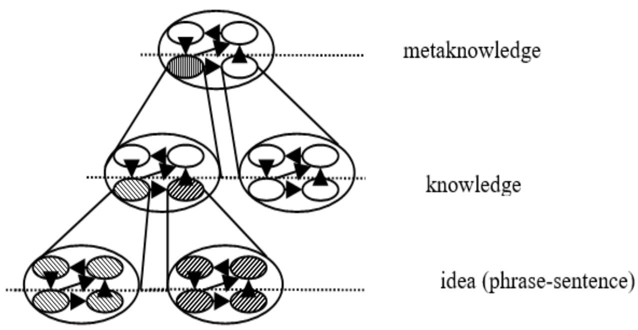

Figure 4

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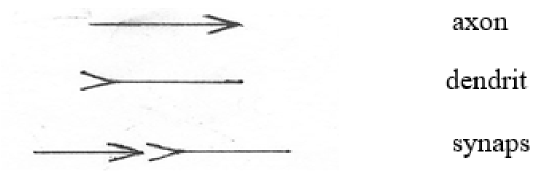
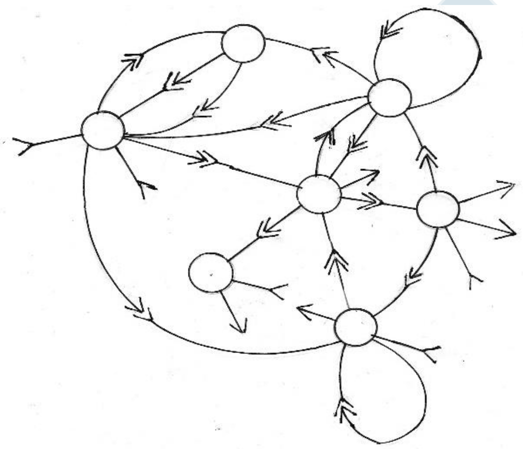
V. SYNERGY-BASED MODELING APPROACH

Modern systems models are largely nonequilibrium models rooted in the concept of entropy. This approach has spurred the creation of various models that incorporate entropy, such as synergy and complexity theory. Synergy refers to the idea that a whole exhibits properties or functional effects that differ from those of its individual Synergy refers to the idea that a whole exhibits properties or functional effects that differ from those of its individual components. Without synergy, there's no integrity. Every system has a structure, composition, and state, and the state of a system is defined by different levels of incompatibility. In general, large-scale systems and their elements can be loosely viewed as a neural model. (Fig.5b). This type of graph or hypergraph was originally devised to describe complex systems at any level, such as the brain's neural model, which can be viewed as a perfect fractal of the universe [11].



a) The elements of neural model



b) The example of a neural model
Figure 5 (a, b).

Synapses lead to the merging of neurons, forming a new ensemble characterized by a synergistic-entropic union. Each synapse, or interaction between any two neurons, recursively creates a new entity a unified neural cluster in which the synergy-entropy relationship, along with its balance and fitness function, has been mutually modified or redistributed. Creation happens when entropy transforms into synergy, and vice versa, when the breakdown of synergy shifts back to entropy.

VI. INFORMATION EXCHANGING

The primitive exchange of information or telepathy was replaced by speech, and later by writing. Here we consider the interactive aspect of information exchange with the environment. For example, it is often the case that people speaking the same language perceive the speech morphologically and syntactically correctly, but they still do not understand the idea of the conversation in terms of content, that is, there is no mutual understanding on a specific topic. In general, understanding means traversing semantic hypergraphs at the epistemological level of the knowledge system of the speaking pairs. The more the intersection, the more understanding there will be. Consider the interactivity according to the following scheme, where the intermediary function is performed by the human language - the linguistic translator performs the two-way conversion (Figure 6) [12].

A Defragmentation and activation take place at the level of meta knowledge in the knowledge system of the **A** narrator (or information transmitter). The following is carried out to move the descending decomposition tract:

letter-sound → word → phrase →conversion in the spoken language→ idea knowledge fragment→ knowledge →Metaknowledge

Information transfer involves a sequence or array of letter-sounds (phonemes) that are perceptible on the receiving side, referred to as B, where a reverse sequential process or ascending composition path is performed. This entails a sequence of subconscious analyses, starting with morphological analysis, where words are recognized from the letter-sound sequence. Next, syntactic analysis occurs, constructing sentences, followed by semantic analysis, which interprets the meaning.

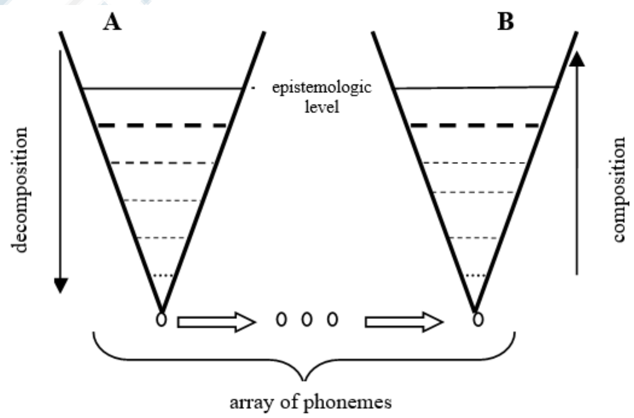


Figure 6

In the interactive process, the knowledge from the high-dimensional level begins to move downwards to break down the semantic "textile" to transmit it "like a thread" to the other side, where the "weaving" begins from this "thread" (textus - in Latin for fabric). Understanding depends on whether the received products correspond to the original.

VII. LEARNING AS KNOWLEDGE BUILDING PROCESS

Our article discusses a hypergraph-based approach to knowledge representation, where an epistemological knowledge model consists of nodes that represent entities (a low-level knowledge graph) and the relationships between these entities. The recursive process of knowledge construction is an ascending process in a hierarchy that involves minimizing the incompleteness or entropy of knowledge. Therefore, for all levels, epistemic knowledge will be complete when its entropy becomes zero.

Knowledge discovery can be thought of as the process of matching (or finding) a semantic query on a knowledge graph with epistemic knowledge clusters (Figure 7). Query matching means when an attractive semantic cluster is found on the knowledge landscape. Otherwise, it will be necessary to achieve the completeness of the knowledge model by self-learning. This is done by reconfiguring the semantic graph or by a self-organized "stitching" process according to the entropy minimization criterion. The process of constructing epistemological knowledge continues as long as the knowledge model is still incomplete.

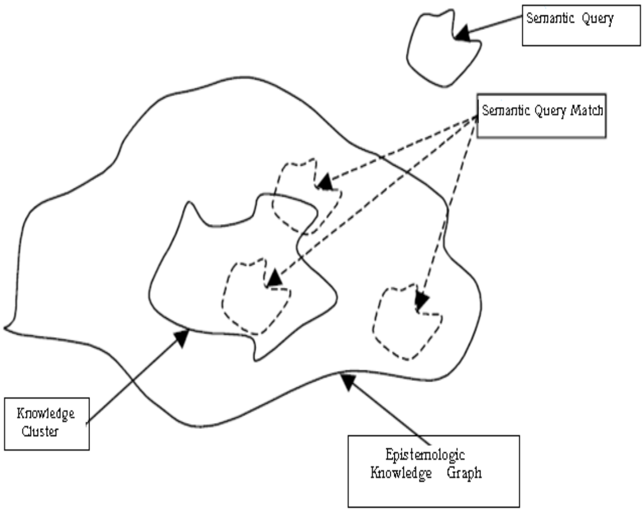


Figure 7

When a semantic query is submitted, a match may be identified by intersecting the query with the knowledge fragment graph. In each instance, various optimization strategies can be applied, guided by the criterion of minimizing entropy. If there is a complete intersection, this signifies a discovery of knowledge. If not, the degree of uncertainty is determined by the level of corresponding entropy or the difference in the graph. Overall, the process of knowledge management can be conceptualized as the algorithm described below, with two potential approaches for implementation. (Figure 8).

Self-learning knowledge assembly as a self-organized process develops a Graph-based Knowledge Representation (GBKR) model, while entropy decreases. After receiving each successive input, the configuration of the knowledge models evolves through the entropy gradient [14].

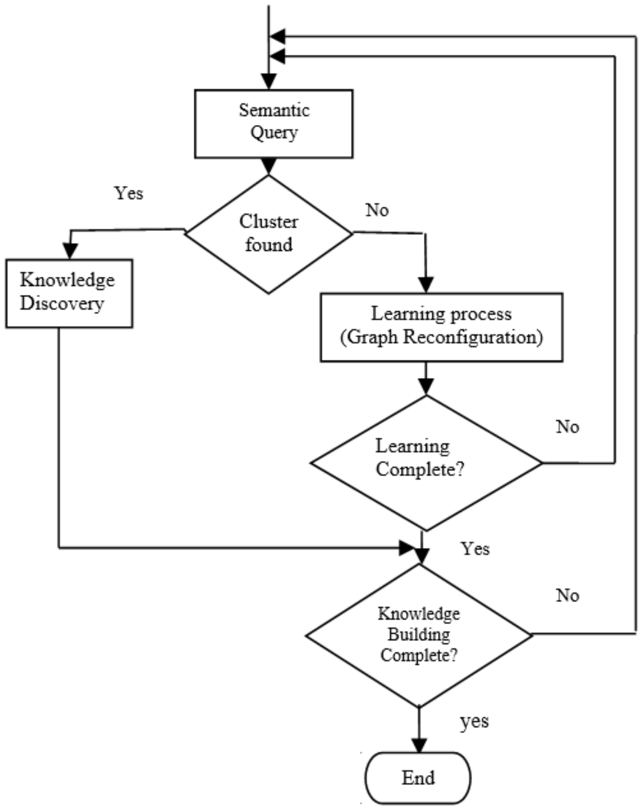


Figure 8

VIII. CONCLUSION

From today's point of view, it can be said that the rapid development of nanotechnology has made possible the production of flexible, neural multi-processor quantum supermachines shortly on crystals, polymers or biomolecules. These machines will replace modern computers. Addressing the challenges involved in building the next generation of linguistic processors could have a significant technological impact on the design of future computers (possibly with a different type of engine) and operating systems. As mentioned earlier, current computer models for artificial intelligence and their associated software are no longer adequate. With a new approach to knowledge representation, it will be possible to work not only with basic text models but also with more complex knowledge structures and high-level knowledge models—an approach that is highly relevant in today's information age. This, in turn, could mark the beginning of a new paradigm in artificial intelligence, the early signs of which are evident in this work.

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