White Paper

Introducing ***knowledge as a tangible and operational concept*** in information technology (IT) has so far proven to be a major challenge.

The ability to perceive, acquire and reproduce knowledge, forms together with language the most fundamental, ***abstract and sophisticated faculty*** of the human mind. In IT, knowledge is often seen as the end point of a sequence of informational complexity – the so-called ***knowledge triangle*** - from ***data*** via ***information*** to ***knowledge.*** As a field in academics, knowledge is the subject of a separate branch of philosophy, ***epistemology,*** encompassing abstract concepts, such as ***propositional logic, truth values***, and the notion of ***justified true belief.*** True knowledge - we don't always know what it is, but mostly what it isn't!

We are here outlining its conceptions in order to appreciate the complexity of the subject, to line up an approach for a feasible introduction into IT, and to present a new theory where ***everything could become very simple***, eventually even paving the way for a ***standard in IT for knowledge representation***.

1. Imagine an e-mail server on which not only the filing and categorization of mails takes place automatically, but also where categories including their logical relationships are computer-generated and visualized on the basis of extracts of information (or knowledge) from the mails. Not only can a ***semantic pattern*** of such categories be an intelligent entry point to your own or your company's e-mails (or knowledge), but also constitute an ***expert system;*** a decision tree that can guide you through the logical steps of communication with customers needing help.

   Only through the development of a new mathematical concept – the ordinal fraction - are we given the possibility to think and look at things this way. We all know: the way we look at things is instrumental for the way we think about things. That ***everything is connected*** is as obvious as the fact that an evening with friends can lead us across all areas of life.

   Ordinal fractions will allow us to ***organize arbitrary complex sets of data as a One***. Our vivid discussions at the dinner table are in fact based on logic - propositional logic - and ***a computable semantic is ruling*** behind the exchange of opinions and thoughts.

   Or imagine an application where the same semantic pattern forms a ***mind-mapping/think tool*** to sort out and formalize thoughts, ideas and eventually complete (business) applications, that allows for a network of people - together, but with individually allocated rights - to formulate and map ideas parallelly, filling the developed structure with contents. An example could be that of an Excel worksheet used for modelling and presenting common data, which is generated and shared online, and where reading, restructuring and writing permissions are handled on the level of predefined cell-structures/contents, each participant appearing in accordance with his or her individual or organisational rights as to access and visibility. In the vision, not only data, but also ***users, functions, commands and templates are in the form of ordinal fractions logically related***.

2. ***Symbel*** is both a way of visualizing data, as well as the name of a start-up company, aiming to introduce a conceptional or natural language-based approach to the handling of data. This paper outlines the main idea in order to ***start the programming of a prototype***. Potentially, the concept can be applied in various technological and commercial fields. ***A patent is in process***, which will protect the idea generically.

   The linguistic approach to data analysis or management is becoming more and more prevalent. Today, deep data, partly "black box" algorithms, can read, interpret, translate and compute complex information. Symbel however, represents an ***open and universal understanding,*** where technology becomes transparent and ***accessible for everyone***. With a normal ***user-approach based on pattern recognition*** as well as moderate learning efforts any person can empower him or herself – individually or in groups - to master the very foundational logical structures of the information society, which up until this day has been a domain reserved for specialists.

The present ***proprietary systems*** of large tech-companies cannot form the long-term infrastructural knowledge base of an open and democratic society, and political actions will have to be taken as soon as technological alternatives are outlined. This very idea could be a ***starting point***.

A truly semantic interface between the human mind and IT not only applies to linguistic and ***symbolic*** rather than ***probabilistic*** algorithms and language models, but allows for - in a playful way - to visualize the way words or concepts are ***mapped in the mind*** thus ***reflecting and enhancing its perceptive and cognitive capacity***.

3. A simple, yet ***fundamental insight*** is that the logical connection between any pieces of data can be rendered structurally by means of either tables or folders or arbitrary combinations thereof - in mathematical terms, table and folder being defined as ***n-dimensional array*** and ***hierarchy***, respectively.

   By using the principles of ***The Ordinal Fraction Method*** - a number-based algorithm developed in the 1980's by the Danish mathematician ***Bo Jacoby*** - it is possible to form mathematical structures of contextualized data (or information) that emulate natural language, albeit in a simpler, strictly logical, and therefore computable form. By following a set of simple rules, the algorithm offers the possibility of generating information structures of any complexity.

   However, since numbers are too abstract to read as structural codes, it is only through the development of ***symbel*** - the ***visual interface*** of the algorithm - that we can gauge its practical and commercial application.

   Words can be mapped and grouped into logical patterns consisting of elements, otherwise commonly defined as ***semantic sets***. In a specific field of knowledge, a general conceptual structure can be built, where words/elements (or sets) are located within the structure in accordance with their mutual relations. Here, the Set Theory applies, with its principal types of relations being:

   - Incompatibility (A><B) means that A+B=Ø. Sets/Elements have nothing in common.
   - Compatibility (A<>B) means that A+B>Ø. Sets/Elements have *something* in common.
   - Subordination (A<B) means that A+B=B.
   - Superordination (A>B) means that A+B=A.
   - Coordination (A<>B) means that Sets/Elements are compatible without one being subordinate to the other.

4. A fascinating but obvious fact about human perception is that ***the making of sense takes place in our minds*** rather than in what's in front of us.

   Having affinity to both language and logics, a symbel visualization appeals to our ***cognitive senses*** and curiosity, as when we are engaged in a conversation or reading a book. Intuitively and in the sense of a propositional logic we are inclined to make sense of what is displayed.

   The use of language takes place in subject related ***spheres***, each with its own characteristic expressions, so that sets of related expressions normally can be identified as belonging to a specific context. Contexts may be arbitrary, however the algorithmic visual pattern of ***symbel*** is universal and consists of easily distinguishable elements and operations. Being accustomed to the methodology, any field of knowledge – familiar or not in

terms of content – appears intelligible and appeals to an attentive awareness. ***Symbel*** works like a visual ***metaphor for knowledge*** of any kind. Everything has its place, and everything is connected.
An experience of visual logic of this kind will affect the way we think about and organize things in general. In a way, ***symbel*** is a ***think tool***.

Since such metaphors of knowledge are based on strictly logical rather than linguistic or syntactic structures, no specific language or mode of writing prevails. In pure semantics, alphabetic expressions of any language and even ***logographic*** (i.e., Chinese) expressions constitute all congruent aspects of one single visual metaphor, and thus can be interchanged at will with no loss of meaning. This demonstrates the full versatility, universality and potential of the idea.

5. The immediate prototype in mind would have the features of the visual interface, as explained in the PP-presentation for ***symbel***. An old, yet fully functional DOS-application, could perhaps be rewritten in a modern programming language. Preferably the two parts of the program – reading and writing in a text file, and the visual interface of symbel - are two entities, where only the latter will be the subject of an extended prototyping process.

Alslev 2021
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