András G. BENEDEK – Gyuri LAJOS

Augmenting Conceptualization by Visual Knowledge Organization

Recent developments within cognitive and computer supported conceptualization help us to see why externalizing conceptual knowledge organization in visual forms proved to be a much deeper problem then it was assumed to be in the pioneering era of artificial intelligence. The answers we offer today situate the development of our symbolic structures within the embodied and intent dependent context of the human quest for meaning and contrast the computational alternatives of *simulating* conceptualization with the *augmentation* of the *human* intellect. In the very years of the 1960s in which computational semantics and machine representations of scientific conceptualization appeared to converge into a happy symbiosis, alternative approaches sought to address problem solving with a view not to simulate but to *augment* the knowledge organization activities of the human intellect. These approaches did not attempt to demarcate personal and objective knowledge; rather they viewed cognitive structures and their externalizations as co-evolving systems. They generalized the so called "Sapir-Whorf hypothesis" (both in a cultural and technological sense) to unfold a new approach which we may call Neo-Whorfianism, developing the central claim that cognitive conceptual structures *co-evolve* with the means of externalization. *Augmentation research* proceeds from this point with the insight that the externalization of human symbol manipulation influences both our language and our way of thinking and it can be given computer support to "reveal the subtle relationships among its interacting elements". While the media theoretic consequences of these ideas surfaced in the work of the members of the Toronto School and their disciples, another ground breaking research program, led by D.C. Engelbart at the Stanford Research Institute, concentrated on their computational implementation.

Unwrapping D.C. Engelbart's Augementation Research Program this talk presents a framework for augmented conceptualization and focuses on computer supported meaning construction and emergent semantics. Linking our approach to the beginnings of General Semantics (Korzybski, 1933), processual semiotics (Peirce, 1909), and conceptions that paved the way from association theories to *knowledge organization* and Augmentation Research (Engelbart, 1962), we "show rather than tell" how the first augmented oNLine System (NLS) proposed to provide computer support for the collaborative solution of complex problems. The extension of these early insights to computer supported knowledge work including the externalization of conceptualization processes explains how the co-evolution of conceptual and computational knowledge architectures generates the emergence of solutions to complex problems. We argue that just as the "state of a language at a given time strongly affects its own evolution", so the development of visual "languages" and their meta-level organization can be treated as an evolving articulation process within a self-organizing system. Such systems are capable of developing into a succeeding state, if (going along with Engelbart) the applied technology provides us with the means/tools for meta-reflection that are able to enhance the utilization of our tacit knowledge in externalized forms. The evolving, self-organizing nature of articulation can be detected in both cognitive and artificial systems, however, for the augmentation of conceptualization the external manipulation of 'things' and their

conceptual architectures in a human created environment is essential both for embodied cognition and for computer supported knowledge organization. Reflecting on current positions on computational (Engelbart) and cognitive aspects of bootstrapping (Quine, Carey) we make explicit their co-active interdependency within intent driven creative problem solving.

We support these points by our exploratory implementation of the kernel of a knowledge augmentation engine, *WikiNizer™Research*, which delivers a semantic visualization framework for human conceptualization. *WikiNizer™Research* as a personal knowledge organization tool augments conceptual problem solving by interfacing personal knowledge and web research. It uses Wiki-like visual semantic knowledge management in the conviction that a visualized meta-reflective analysis of Knowledge Architectures (in the form of concept nets, and higher conceptual architectures) helps us discover effective concepts. Our first experiences going on the "WikiNizer Way" of conceptualization confirm that concept maps and tools of conceptualization which aim to enhance our visual knowledge organization and symbol-structuring, should not only aim to supply *static* computational representations, (e.g., ontologies) of inter-personal knowledge but they should also support the situated *dynamics* of concept formation. Unlike 'God's eye' conceptions of ontology building we note that the externalization of semantic information is *intent dependent*, and point out that defining new relations and discovering semantically rich structures is a precondition of emergent semantics and meaning construction. *WikiNizer™Research* creates dynamic graph based visual structures which articulate the relationships that exist within knowledge items, and facilitate the emergence of new concepts in the form of associative trails bush of contents organized in page based graph structures. After outlining the advantages of graph structures we claim that the uniform treatment of intent dependent sorts, attributes, aspects, and typed relations within some given material supplies us with a technological key to conceptual reorganization at the meta levels of the knowledge graph. At the same time it makes possible the simultaneous mapping of the corresponding changes into the organization of the domain knowledge. The explication of our reasons for implementing a *dynamic* visual conceptualization environment makes clear that some features of this environment existed prior to the Turing Galaxy, as scientists sought to manipulate, cluster, and catalogue objects in the world, and created tools for recording spatio-temporal processes. We point out in light of current problems of the semantic web that the computational integration of intent dependent problem solving with dynamic visual concept organization is far from being achieved however, fifty years after Engelbart's first implementation of a conceptual framework for "Augmenting the Human Intellect."

András G. BENEDEK, PhD, CSc, works in the field of Learning Sciences and Dynamic Epistemic Logic as senior research fellow of the Institute of Philosophy at the Research Centre for the Humanities, Hungarian Academy of Sciences. As former head of the Department of Logic, Pázmány Péter Catholic University he directed DE Program Development at the Faculty of Law and Political Sciences and worked as director of e-Didactic Knowledge Center of LSI Information Technology Learning Center. He was a post doctoral research fellow at The Queen's College, Oxford, university scholar at the University of Notre Dame (Indiana), research fellow at CUA (Washington, D.C.) and UIC. He was coordinator of various EU projects as international advisor of APERTUS Public Foundation, responsible for e-content and program development as director of education of EDUWEB PLC, and as scientific advisor for projects in the framework of the Economic Development Operative Program of the New Hungary Development Plan. E-mail: agbenedek @gmail.com.

Gyuri LAJOS 1975-79 read Physics and Philosophy at Eötvös Loránd University. 1981-84 BSc Hons in Physics and History and Philosophy of Science at the University of Leeds. 1985-92 PhD by research at the University of Leeds on Language-Oriented Programming. 1985-95 research assistant: verifying Synchronous Concurrent Algorithm in NuPrl, University Modular timetabling using Constraint Logic programming. 1996 to 2002 software consultant at Easysoft. From 2003 freelance software consultant. 2003-05 DTI Smart Award Research and Development on Personalized Mobile computing, Opidox. 2008 to present day works as lead developer and part time technology scout at Lufthansa Systems, Budapest. For the past three years together with a team and his co-authors works as the founder of Wikinizer, a Personal Knowledge Augmentation engine and its collaborative reference model, called "Conceptipedia". E-mail: gyurio@gmail.com.