POSSIBILITIES OF PARALLEL INFORMATION PROCESING IN THE 1990s*

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This essay presents a short overview of a research project in which informational logic is developed and investigated in a general and the informational parallelism in a particular manner. This investigation opens a new outlook on possibilities of parallel information processing in architectural as well as in operational philosophy and logic. In this project information is understood as an extremely parallel dynamic phenomenon, which arises in the realm of informational. Primarily the essay gives comments on the following topics: parallelism as information, informational machine, informational program, and some aspects of informational logic, its formalism, and axiomatization.

1. Introduction

The carrying out of the Parsys Project of Iskra Delta Computers has brought to light and accentuated also several questions concerning possible computer scene in the next decade. The criticism of distinguished philosophers and computer scientists in the field of artificial intelligence has been understood as a substantial change of the optimistic research initiative and as the arising of a new philosophy considering the possibilities of information processing in the future. In the leading professional journals relating computer science, new generation computing, parallel processing and the traditional field of artificial intelligence, a new philosophical and technological paradigm is coming into existence. Roughly, this paradigm tells that, for instance, the possibilities of numerous new logics of knowledge, belief, awareness, reasoning, epistemology, cognition, information, etc., will certainly influence the structure and organization of intelligent machines. Simultaneously, the appearance of new technologies exploring the concepts of biological, neural, and solid state nets will enable the implementation of extremely complexly structured and organized parallelism of information.

In this essay, our attention within the mentioned paradigm will be focused on the possibilities of parallel information processing. In this context, the necessity to redefine the notion of information is becoming essential. The common sense of the contemporary information era tells us that the notion of information is used in its narrowed meaning prevailing in the previous century, when information processing, for instance, in living organisms, was mostly a product of metaphysical imagination. Thus, together with the new philosophical paradigm in the field of artificial intelligence also the new paradigm of information has to be considered [1].

2. What is Parallelism as Information?

Nowadays we imagine information as an extremely dynamic phenomenon appearing in the cosmic, living, and artificial realm. By its belief, awareness, and commonsense reasoning, a human being can look into its own information processing by self-observation, self-investigation, self-cognition, and self-comprehension. Through such a looking into its own self, a being understands information in a much more complex way than it can be comprehended from the positions and theories of contemporary information science. For instance, the measuring of information within mathematically founded information theory does not concern the meaning of information or how this meaning or understanding of the meaning is coming into existence in living systems.

What is information as information? Information informs itself and other information and is informed by itself and by other information. This principle says that information informs actively and is informed passively. Information performs as subject and as object. Information can be viewed as operator and as operand. Information arises in its active and passive informing. In general, informing of information is a synonym for the so-called informational arising. The adverb informational is introduced to represent the described nature of information. In this context we can speak about informational form and informational process, of informational structure and informational organization, and certainly of informational spontaneity, circularity, recurrence, parallelism, sequentialness, serialness, etc., which are all informational notions and perform as information.

Informational arising means circularly spontaneous coming of information into existence, but also changing, vanishing and disappearing of information. Informational arising has to be understood as a creative component of information and its informing. Information which comes to existence is called counter-information and it has to be informationally embedded into existing information, otherwise it vanishes as informational noise. The "informationally creative" has the meaning of spontaneous, unforeseeable, autopoietic, self-structuring, and self-organizing informing of information. It becomes evident that the so-called cultural forms, for instance, philosophy, art, science, technology, ethics, etc., to mention only a few of them, can be brought into the informational framework of understanding.

It seems that informational parallelism is one of the most complex notions the mankind was ever capable to think, comprehend, and implement. Informational parallelism is a structure and organization of informationally interwoven informational forms and informational processes, which inform each other in a spontaneous, circular, recurrent, unforeseeable way. In this interweaving of informational forms and processes, complex information is coming into existence.

Currently, informational parallelism belongs to the most concealed and unrevealed phenomena and calls for philosophical and technological illumination. Parallel informational processes open the most complex spatial and temporal interweaving, dependence, and arising, as have ever been imaginable. Although, human mind in its basic structure and organization operates in a parallel-serial manner, on the higher cortical levels, in its global informational organization, for instance, in functions of belief, awareness, reasoning, world model, intention, and understanding, it appears, behaves, and experiences primarily as a serial or sequential apparatus. Since the basic parallel-serial informational structure and organization of the mind are not directly reflected in human awareness and conscious reasoning, the conscious part of human mind does not dispose of the required fundamental experience for an adequate conceptualization of

informational parallelism. Thus a philosophical background of informational parallelism has to be constructed and investigated, for it cannot be discovered sufficiently in detail [2].

3. Parallel Informational Machine

The principle of parallel informational machine can be described [1] in the following sense: The parallel informational machine performs as information. Informational parallelism is inherent to informational machine. This means that its structure of forms, components, constituents, and architecture is informational, for instance, in its physical, biological, or, generally, technological constitution. If informational, the architecture of informational machine has the property of parallel informational arising, for instance, in varying of the machine connectedness, coming of structural components into existence, growing and vanishing of architecture, etc. In the same way the organization of informational machine is performing informationally in functional flexibility, controllability, programmability under changing inward and outward conditions. Architecture of an informational machine is dynamic (brain-like, for instance), is dynamically controlled, interchangeable, interweaving, arising, and depends upon the machine's environments.

The parallelism of an informational machine is a regular property. Parallelism of information is the most general form of informational interweaving. Information is always interwoven, which is only a synonym for informational parallelism. Interweaving corresponds to informational net structure and organization. Evidently, a particular strategy is needed for exploring informational nets in an optimal or economically complex parallel way. Parallel informational machine is only the synonym for various informational nets, irrespective of their specific natures, which can differ a great deal by their structure and organization.

4. Parallel Informational Program

The principle of parallel informational program can be described [1] in the following way: An informational program is simply information which spontaneously informs, embeds, arises, and counter-informs in an informationally circular manner, within an informational machine. An informational program informs, which means generates, changes itself and other informational programs during their execution and is influenced in such an informational way by other informational programs. It is used and embedded into an informational machine for production of information. This information can be, for instance, intelligence, specialized creativity, expertise, problem solving, dedicated informational functions, etc.

Evidently, there is an essential difference between a computer program and an informational program. The former is algorithmic,

mathematical, procedural and informationally static, whereas the latter is informational, intelligent and informationally dynamic. As a rule, a computer program has a stable, non-variable program structure and program organization. Its definition (declaration) cannot be changed dynamically during its execution, by the parallel execution of itself and other programs, data, etc.

An informational program performs as information. In this respect, such a program is also an informational object (operand), which can be informationally changed during its execution. A typical computer program is always performing as a subject, by which non-program objects can be changed and can arise as results of its performing. In principle, the request to informatize a program concerns essentially different programming tools from those that are in use today.

5. Parallel Informational Logic

At its beginning, parallel to the Parsys Project, the study of informational logic was initiated, with the goal to construct adequate tools concerning informationally parallel machines and programs in particular. This study of informational logic has to be understood as a free-lance undertaking within IDC, which embraces the philosophy of the redefined notion of information and the so-called axiomatization of informational logic. The logic, which in its main part deals with informational parallelism, is being developed up to the form of an informational axiomatic system. In this regard, the system is not a usual axiomatic approach of pure mathematical doctrines, but above all, incorporates the so-called informational principles. This logical theory represents a generative axiomatic system the intention of which is to preserve semantically the arising nature of the redefined notion of information.

The new formalism introduces several symbols for operators with the already known, but also a new semantics. Two types of variables appear: the operand and the operational ones. Operational variables can be particularized and universalized according to the needs, goals, and applications of a case. In operands, also the so-called functional operators can appear. In these cases operands perform operationally in an implicit manner. The most general operational variable has the meaning of informing. This operator, called informational metaoperator, can be particularized and univesalized, i.e., substituted in a logical expression in a non-uniform way. The axiomatic system of informational logic is constituted by basic informational operand and operator variables and informational constants of both types, of formation rules defining the syntax of informationally well-formed formulas, of informational axioms, and of the so-called transformation rules for transformation of axioms and formulas.

The axiomatic basis of informational logic is still in the phase of development and formal construction [2, 3]. Operators of general parallel informing are, for instance, informing in parallel, possible informing in parallel, necessary informing in parallel, non-informing in parallel, informational carrying off, informational bringing, blocking to carry off, blocking to bring, sending and informing. receiving and informing, non-sending and non-informing, non-receiving and non-informing, causing of informational appearance, non-causing of informational appearance, coming into existence, non-coming into existence, causing informational end, coming to end, non-causing informational end, non-coming to end, choosing among informational alternatives, choosing and informing, being informationally impressed or memorized, recalling, disintegrating and informing, informing similarly, interrupting, breaking down, enriching, cyclical parallel informing, etc.

6. Conclusion

The theory of parallel processing within informational logic can be the basis for conception, design, and application of future parallel computing systems. In this context, the development of informational philosophy and to it adequate axiomatization and formalization of informational concepts are becoming necessity of the future. This could be the way to really intelligent systems which would cope with living minds and living systems.

References

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