Organization of the Brain in Light of the Big Data Philosophy

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Abstract—The paper presents a computational scheme for the brain using Cloud Computing in the Holographic Universe. The surmised construction captures all the basic operational characteristics of the brain in health and disease.

Keywords—Big Data Computational Model; Brain design; Mental disorders; Holographic Associative memory

I. INTRODUCTION
The appearance of intractable complexity of the brain merely shows that its operational principle is not fully understood. Mass production of zillions of human and animal brains on the Earth suggests that the design of the brain must be robust. The brain encounters an overabundance of information, the so-called “Big Data” situation, which is qualitatively different from conventional computing.

With the Big Data methodology the developed design of the brain captures all the basic characteristics the brain in norm and pathology. The Big Data computational model explicitly operates only with a small portion of the available information. The rest of the information serves implicitly as a selection context playing a crucial role of the “unconsciousness”.

II. HOLOGRAPHIC ASSOCIATIVE MEMORY FOR BRAIN CONSTRUCTION

Due to the immensity of information filling brain’s memory stepwise, even in parallel fashion, is not feasible – it would take thousands years. Instead, it is considered that formation of human mind starts in the womb by joining cloud-computing facilities in the Holographic Universe. A decisive question is how the brain gets instructions for performing its countless tasks. The suggested computational scheme for the brain is data-driven; it runs by a transition diagram from memory as a Turing machine not by special software instructions as a von Neumann computer. The notoriously slow processing of neural circuits is offset by fast memory access, and learning occurs just through the amassment of Big Data.

A new type of holographic associative memory for the brain construction is surmised. Incoming data are continuously recorded in a moving 2D layer at the border of the memory. This construction provides a combined operation of “Writing” and “Marking - Reading”. Such a double functionality access results in a common illusion that brain has distinct short-term and long-term memories. Indicatively, structural distortions of the brain affect both operations uniformly, so different symptoms of Alzheimer’s dementia – loss of recent memory and recall of early events – come out simultaneously.

The resolution of multiple responses in the introduced holographic associative memory is performed by stream selection of a prevalent element. The stream recall of information from earlier stages of life is easier to process than that from subsequent stages since the former case involves lesser samples of memory layers than the latter case. Roughly speaking, it is about three times easier to retain some information in 20 year of age than in 60 years of age. It is this limitation of the algorithm for stream resolution of multiple responses that imposes the upper bound on human life.

Functional specializations of the different regions of the brain are determined by their correspondence to the respective places in the 2D recording layers. Glia cells fix the states of the functional regions of the brain and thus constitute an interface between the neuronal circuitry and memory. This interface is updated by asynchronous inputs from the environment and by regular information streams from memory. Maintaining the given interface an organism acquires self-awareness leading to the concept of consciousness.

III. COMPUTER SCIENCE INNOVATIONS

The Big Data organization of the brain involves qualitatively new computer science solutions that can be basically described as follows:

1. A new construction of holographic associative memory. It combines recording and searching and thus leads to an illusion of having short and long term memory in one level storage

2. A new method for resolution multiple responses by a rational extraction of a predominant element. This produces “unconsciousness” and “intuition”, so the
brain works analogously to the theoretical “Oracle”
machine.

3. A new simple way to avoid complexity of
programming by data-driven control. Brain operates
using “mosaic” transformations of different cortical
regions. Thus, brain maintains continuous self-
awareness through integration of inputs.

4. A new principle for fault-tolerance with graceful
degradation and progressive enhancement. Such
adaptation is incorrectly attributed to neuroplasticity.
Actually, this quality elucidates the most mysterious
property of “mind over matter”.

IV. CONCLUSION REMARKS

The conceptual scheme of the brain for handling the Big Data
situation is simple as shown in the figure below. Major
publications associated with this work are presented in [1-5].

Most vividly the suggested organization of the brain can be
verified considering variations from the usual population
patterns of birth dates for a number of neuropsychiatric
disorders, like observable excess of autism births in March
[6]. According to the presented concept the etiological factor
behind these effects is the sensitivity of the biological
processes to the positioning of the Earth on the solar orbit as it
is related to the holographic mechanism of the Universe.

Fig. 1. The summarizing outlook of the brain: slow Turing Machine with fast componentwise mixed transitions for 2D states

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