Symphony of Matter and Mind

Part four

Algorithm of the Mind
Teleological Transduction Theory

Chapter synopsis:

1. What is the Mind?

The problem of theories of consciousness that is usually called an 'explanatory gap' is that they fail to answer the question of how physical properties of the physiological substrate of the brain give rise to the subjective experience of sensations, feelings, desires, thoughts, memories, and other mental phenomena that we combine in the word 'mind.' This volume starts to develop the Teleological Transduction Theory (TTT) that aims to cover the gap.

The Mind is a process that works according to a certain algorithm based on physical laws. Taking a clear definition of this process, the chapter starts to expand it by offering a purely physical and technological perspective that does not contradict but complements the standard physiological and psychological points of view. It contains a physical definition of the brain and a general scheme of a self-learning algorithm that provides for the existence and development of the Mind.

2. Hybrid Analog-Digital Brain.

The mainstream neuroscience models of the neural code consider it to consist of identical neural spikes and just provide different suggestions about their counting. Thus, the spikes are considered discrete symbols of a digital code. Unfortunately, this approach did not lead to the deciphering of the code despite the efforts of generations of researchers. Perhaps this is the result of the fallacy of the original idea.

The chapter considers the advantages and limitations of both digital and analog computing. It proposes the hypothesis that the brain exploits both ways of coding and is in essence an analog-digital device. Step by step it reveals the hybrid signal transduction paradigm and gives clear examples of technological solutions used by the brain in different perception modalities.

3. Symphonic Neural Code Hypothesis.

Some mainstream models of neural code are technologically absurd and contradict the realities of brain efficiency and speed. Some cover just part of the observed phenomena and fail at explaining the others. As the way out of a conceptual impasse that has lasted for decades,

the chapter develops the Symphonic Neural Code hypothesis that reveals the mystery of the high performance, speed and efficiency of the brain based on the idea of the hybrid analog-digital nature of neural computing.

4. Neuron as Information Creator.

The chapter looks at a neuron from physiological, physical, technological and informational points of view showing how this element of the system performs the encoding-decoding function.

5. Discreteness and Continuity of the Mind.

The chapter proposes hypotheses about how the brain creates continuous representations of signals and a coherent picture of the world, despite the discretization of signals during initial sensory processing.

6. Filters of the Brain.

The chapter looks at the basic principles of signal processing and shows how the brain uses them in performing the analysis and subsequent synthesis of the signals to compile the picture of the world. The chapter offers an intuitive visual and mathematical model of what functions various brain filters perform in sampling, quantizing, modulating, and integrating signals of the outer and inner world. Such a fundamentally new approach to the elements of the nervous system offers a map of the brain, which focuses on the technological chain of signal transduction.

7. Fine-Tuning the Brain.

From a physical point of view, all environmental signals are modulated by the filters of the brain so that their parameters correspond to its characteristics. From a technological perspective, modulation is the basis of the encoding process as it imposes a certain structure on the signals flow. The chapter shows how the brain performs pulse-amplitude, pulse-frequency, pulse-position, and pulse-width modulation of external and internal signals. Thus, the instruments of the orchestra of the brain fine-tune to the music of the world and to each other to perform the symphony of the Mind.

8. The Amazing Self-Learning Machine.

The chapter shows how the self-learning algorithm proposed within TTT and described in the book allows the brain to solve the problems of survival and adaptation. It also highlights

the similarities and differences between modern algorithms in machine learning and algorithm of the living Mind. The last chapter returns to the definition of the Mind given in the first chapter and offers a more detailed one taking into account all the functional, physical, physiological, and technological issues revealed in the book. This paves the way for further detailing in the next parts of the "Symphony of Matter and Mind" series.