Hierarchical Analysis on Cognitive Systems

Abstract
This paper compares some cognitive systems in various academic contexts. The authors consist of 7 researchers from different fields (science & technology studies, robotics, euroscience, plant nutrition, physical oceanography, molecular pharmacology & neuroscience, and medicine), and discuss fundamental issues on cognitive science aiming at provoking a novel approach to unveil the mystery of intelligence.

1 Self-assembly system can be viewed as a cognitive system which doesn’t necessarily require an explicit sensory mechanism. It just obeys local environmental rules but capable of autonomous configuration of global structures.

2 MEG enables to see correlations among neuronal activity in a typical model of such correlations in response to multimodal environmental changes. From the magnetic fields evoked by the changes, it was revealed that sensory systems detect multimodal stimulus changes in the supratemporal area after approximately 100 ms and much before cognitive detection.

3 Alzheimer’s disease (AD) is a most common form of dementia characterized by loss of neurons and synapses, resulted in progressive cognitive dysfunction. However, the detailed mechanisms of cognitive systems in humans are not clearly defined. The difficulty in developing a remedy for AD is determination of a cognitive system between human and animals which are useful for developing drugs. To solve this problem, further investigation of cognitive system in animals and elaborated cognitive impairment model(s) are required.

4 In sociology, behaviors of mass people are studied in the flame work of cognitive science. Their decisions are thought as a reflection of the input, but the processes are considered as complex systems.

5 Graminaceous plants produce and release metal chelators called metallophytosalicylates (MAs) from their roots. MAs bind to and solubilize ferrous iron (Fe(III)) insoluble in the rhizosphere. Under iron deficient condition, the genes involved in phytosiderophores (MAs) from their roots.

6 Numerical ocean modelling, which is a central methodology of physical oceanography, can be recognized as a kind of cognitive systems. Using an ocean state at a moment for the initial condition and boundary conditions at the sea surface, the model outputs the subsequent state based on fluid dynamics and thermodynamics. However, all of the phenomena in the ocean cannot be represented due to numerical resources, and their effects are taken into account through empirical parameterizations (e.g., turbulent motions smaller than the model grid interval). Searching appropriate parameterizations is equivalent to trying to elucidate a cognitive system.

7 Cognitive system in a broad sense can be also seen in an organismic time span. We (living systems) begin as a mother cell having a limitation in the period being alive. We are perpetually asked the meaning of existence.

References