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Learning Process in Large System

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1. The object of the paper is to give an approach which may provide with a general formulation of learning processes in large system. The standpoint of the author in this approach is based upon a logical consideration having been given by the author in the Dubrovnik Seminar on Large System in Biomathematical Sciences in 1968, August, and partly illustrated by him in his Japanese monograph [9] published in 1969 and also in his recent paper [12] in 1970.

2. Three Coordinations, Ist ; IInd and IIIrd ones, are introduced in the literatures [9] and [12] due to the author. The summary is given in Table 1.

The 1st Coordination consists of three principal coordinate axes : (a) objectivity, which contains three aspects (a_1), (a_2) and (a_3) ; (b) subjectivity, which contains (b_1), (b_2) and (b_3) ; (c) practice, which contains (c_1), (c_2) and (c_3).

Similarly for the IInd Coordination consisting of three principal coordinate axes. Now the IIIrd Coordination consists of three subspaces ($\mathfrak{N}$) Control, ($\mathfrak{L}$) eizon and ($\mathfrak{C}$) creation. Each of these three subspaces has the six aspects to be gathered from the Ist and IInd Coordinations, along the first, the second and

Table 1. Three Coordinations I, II and III

I and II \ III	III ($\mathfrak{A}$) control	III ($\mathfrak{L}$) eizon	III (3) creation
I (a) objectivity	(a_1) pattern	(a_2) chaos	(a_3) transformation
I (b) subjectivity	(b_1) operation	(b_2) adaptation	(b_3) strategy
I (c) practice	(c_1) optimalization	(c_2) stability	(c_3) learning
II (α) cognition	(α_1) deduction	(α_2) induction	(α_3) abduction
II (β) direction	(β_1) control	(β_2) eizon	(β_3) creation
II (γ) evaluation	(γ_1) efficiency	(γ_2) reliability	(γ_3) plasticity

the third columns respectively. In particular the new Japanese terminology "eizon" coined by the author comes from the combination of "ei" meaning management and "zon" meaning existence.

3. It is the opinion of the author that it is indispensable to take into our consideration all of these 18 fundamental aspects given in Table 1, in order to describe all the essential features of learning processes in large system.

An illustration of various formulations of control processes is given with reference to our three Coordinations.

This illustration includes our discussions and comments upon some of current theories of control processes which we owe to various authors such as Bellman [1], Box [2], Pontrajagin [16], Robbins-Monro [17] and Wiener [18] and the previous contributions due to the author himself [3]-[12], and the illustration may be said to be suggestive how far these formulations for evaluating can be expected to be useful for discussing large systems and for seeking for uncultivated areas which may be estimated to be important in discussing large systems.

4. In contrast with small systems, it seems to us to be indispensable to emphasise III ($\mathfrak{O}$) eizon space and (III) ($\mathfrak{L}$) creation space, besides III($\mathbb{C}$) control space.

This general assertion implies in particular the following specifications.

(1°) Some of current mathematical formulations of control processes can be and should be modified so as to reflect some characteristic features of large system.

(2°) Various formulations which have been proved to be effective in their respective domain of validity can be and should be integrated as one mutually interconnected approach for discussing large systems.

5. Learning processes in large system should be discussed in the IInd Coordination in which the r̂oles of cognition and evalution as well as direction should be carefully scrutinized.

It is also remarked that the notion of large system can be found in various fields of human activities and that it is indeed quite benefitable to our consideration of engineering large system to take into our consideration various examples from those associated with medicine, quality control, and public welfare and so on, as the author points out in his recent papers [13], [14] and [15].

Literature

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