A Study on the Information Processing System
——from the view-point of the relations between internal
and external processing system ——

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Introduction

We can think that the communication process is realized as an information system. According to this, flow of communication is thought of as flow of information. A man accepts various informations, and then he adapts that which harmonizes with his psychological system and personality. He evokes his behaviors found on this process. At the same time, a person who gives information to him is affected by his attitude. That is, in the communication process, we have two ways of information flow. One of them is a flow of interchange from person to person. The other is an internal flow that interchanged in one's own personality. That is, communication between two people consist of these interpersonal relationships and intrapersonal relationships. Here, we find a process of information in action. Contents of communication transmitted through interpersonal relationships are processed through intrapersonal relationships. And then, a man evokes various expressions as responces to the contents of communication transmitted from the beginning. That is, here, these various expressions of responses have functions as new stimulus and information for the beginning of the next communication. We can point out that the process of communication is the process that gives birth to new communication, one after another. At the present time, we use a computer system for transmitting information. The transmission process by computer is thought a communication process, in itself. Because of this, we have to think about this system from the view-point of our above descriptions on the communication process.

1. Basic Knowledges on Communication

Now, various studies on communication have been continued from various view-points of sociology, psychology, behavioral sciences and so on. For oxample, Herbert H. Clark studies about indirect speech communication. In this paper, he describes that we, humans,

accept various information through direct speech more than contents that are told directly. And, K. Kawamura studies about child-adult interaction through communication. Yet, M. Michael Akiyama publsshes his paper about the answering system in dialogue.

One focus of studies on communication, is the process between acceptance of contents transmitted through communication and response according to this acceptance. Because, a man accepts various contents of informations through communication and responds against them. That is, a man reponds according to the contents he accepted through the communication.

His responses evoked through the communication process is called behaviors in sphere of psychology. A focus of psychology, in the present time, is man's behavior. According to this, we want to set a focus in this paper on human behavior. But, when we want to explain about occuring behaviors or various phenomena of behaviors, we must set a focus on the communication process. Because, human behaviors are evoked by the communication process. That is, we think that human behavior through communication, primarly, depend upon the communication process. In this case, the process of communication is found as a problem of study with its contents. Above all, when we find communication by humans as a system of information, such a view-point become more important. Because, a communication process is thought of as a systematic flow of information, and it is a flow of information that has much influence upon human behavior.

2. Kinds of Communication

The kinds of communication are roughly divided into two kinds ; verbal communication and non-verbal communication. The former is a communication by words. That is, a process who want to transmit anything by his own thought, will and hope into words, and a person who participates in this communication catches them through words. The latter is a communication depend on a human gesture, expression by the eyes, body motions and so on. According to this, contents of communication are not directly transmitted like verbal communication. A person who accepts information through this non-verbal communication must understand the contents through various expressions of a person who tries this communication.

Thus, as we described above, communication is divided into two aspects, but in our daily communication both of them are frequently used together. That is, we had experienced many a time, an understanding of communication all the better for it.

Yet, we can divide the kinds of communications into direct communication and non-direct communication. The former is a communication transmitted through relating face

to face. In this communication, information is directly transmitted to the other party. So, a person who participates in this communication understands the contents of communication through listening directly to the words from the other party and seeing the various gestures and expressions by the body. The latter is a communication in which information is transmitted through letters, messages, and sometimes through computer systems. This communication is transmitted without direct interactions. A person who accepts information has to understand the contents of communication without a meeting with the other party. The quantities of information are much restricted within narrow limits.

These communications consist of a person who gives various informations and a person who accepts them. At the same time, both of them evoke various behaviors according to flow of these information.

3. Communication Process and Information Processing

Communication process is generally composed of two processes, external communication and internal communication. The former is a communication transmitted between two persons. The latter is a communication interchanged in personality. When we catch new knowledge and information, they are adapted into our personality after going through relations with existing knowledge, cognitive pattern in own personality. J. Piaget calls this process "assimilation" and "coordination". Yet, W. James pointed out that we have two selves; subjective self and objective self. He says that humans form internal relations between both of them in personality.

Humans have internal relationships for communication, such as this, and various information transmitted to himself have to pass this relationships. At this juncture, information gained by himself are transformed to conditions fitted for himself. At the same time, he evokes behaviors of himself according to the informations transformed in his personality. And in the following step, behaviors by him function as new information and stimulus for beginning new communications.

This process is as follows; 1) sending out information by an informer, 2) others catching the information, 3) internal processing of personality by those caught the information, 4) evoking behaviors by him, 5) sending out new information by him. In this whole process, process 1) to 2) and 5) to the next step is proceeded as interpersonal communication, and process 3) and 4) is proceeded in personality as intrapersonal relationships.

Communication process such as this applies in to an information processing system by

computer. For example, informations are sent out to a computer by in-put of informations. The computer catches the informations, and talks with the informations according the program (soft-ware). That is, here, internal processing is processed in the computer. The computer shows its results (out-put), when she has finished the internal processing. At this time, we can get new informations shown by the computer. And then, we evoke behaviors accrding to data and informations given by the computer. In this case, data and information shown by the computer function stimulus that evoke our behavior. That is, we evoke our own behaviors under the influence of stimulus received from the computer. Yet, as a result, it is possible that we may send out new data and informations to the computer.

Here, we must notice that the computer or data and information given by the computer evokes our behavior. That is, we adapt them as motive for our behavior. In other words, the computer or the results of the computer (data, information) are joined with our behavior. Data and information shown through the processing of the computer are new informations for humans to differ from data and information sent out to the computer in the beginning. That is, the computer system bears new information through an internal processing system. At first, the computer catches data and information, only in a passive manner. In this step, the computer, as it were, responds against data and information. But, she becomes active as soon as she has finished processing them. At this time, she stimulates human behavior.

Because of this, she has two aspects of response ; response against data and information, and stimulus against human behavior. This process resembles the communication process mentioned before.
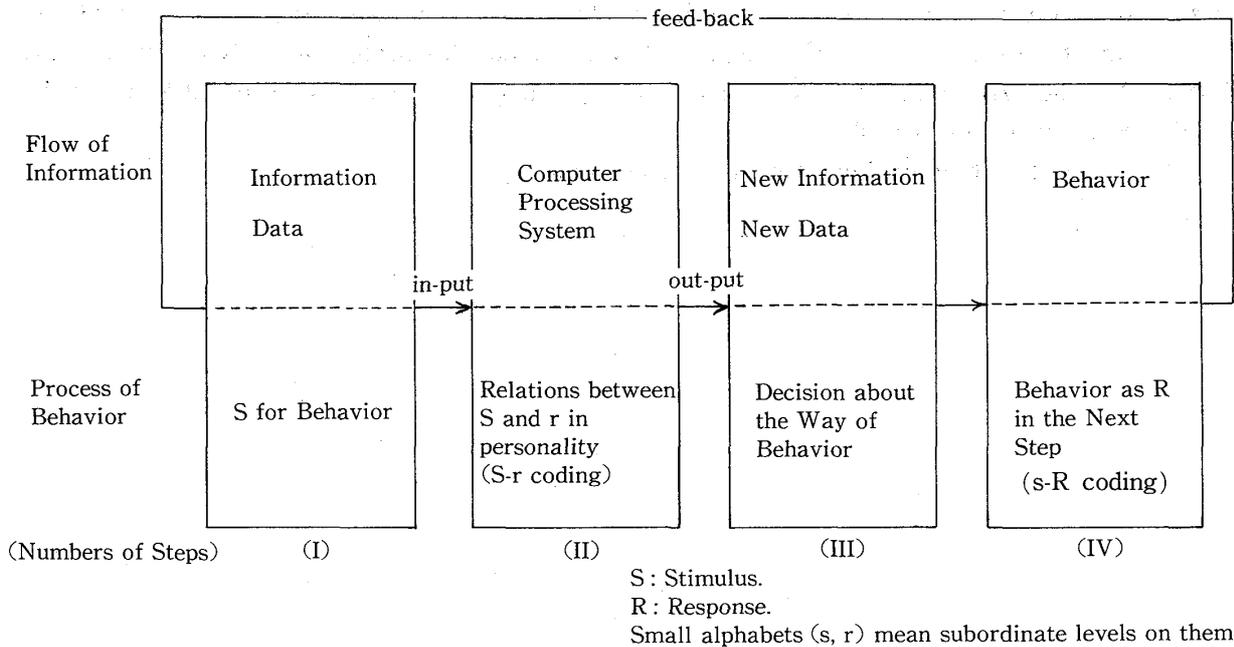
In the communication process and human behavior process, one behavior has two aspects, stimulus and response. A man evokes a behavior as aresponse against stimulus. At the same time, this behavior evoked as response functions as stimulus for behavior in the following step. Similarly, in the communication process, contents gained through communication, at the same time, functions as stimulus to bear new communication.

The information processing system is the same process. These relations in communication in behavior is called "coding". According to this, we can understand the information processing system by computer from the aspect of this "coding". These relations of "codings" to behavior and information processing system are shown in Figure-1. This Figure shows the joining of both processes.

The process from Step-I to Step-II in this Figure is the same process of oxternal processing as the process from Step-III to Step-IV. But, Step-II is the internal process. The human behavior is realized through these four steps. But, speaking about behavior,

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Figure-1. Information Process and Process of Behavior.

		feed-back		
Flow of Information	Information Data	Computer Processing System	New Information New Data	Behavior
		in-put ⟶	out-put ⟶	⟶
Process of Behavior	S for Behavior	Relations between S and r in personality (S-r coding)	Decision about the Way of Behavior	Behavior as R in the Next Step (s-R coding)
(Numbers of Steps)	(I)	(II)	(III)	(IV)

S : Stimulus.
R : Response.
Small alphabets (s, r) mean subordinate levels on them.

we can not see step-II concretely. We behave freely, as though we do not pass this step. But, this step has a very important role for our behavior.

Step-II as the information processing system by computer is set by "programing". And, new informations are shown to us in step-III as soon as step-II has finished. After we got new information, we evoke various behaviors based upon them. This is step-IV.

Step-IV is not the ultimate end of behavior. The behaviors in this step change into new information, and go back to step-I. Human behaviors repeat this process. In general situations, this whole process is similarly repeated in "Flow of Information".

4. Conclusion

At the present time, the information processing by computer is treated as an internal system in the computer itself. But, if the use of computers in our society increases, we have to consider the relationships between the computer and us. Especially, we must give our best attention to a computer that bears new information. These informations function as motives for human behaviors. Because of this, we must locate an information processing system that relates to the human and the machine (computer system). That is, it is very important that the information processing system itself is set up effectively, at the same time, its system relates to human life.

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