Opening Address

Shizuo Fujiwara

This symposium is named as the International Symposium on Shin-anzen-gaku. Shin is a Japanese term and means new. Anzen-gaku refers to the study of safety. Therefore this symposium is the meeting on the new study of the safety control and risk management, SCRM, and actually the 2nd one which succeeds the 1st one which was held in 1987 October also in this city of Yokohama with the sponsorship of Kanagawa University.

The reason why we say "new" is that our study on SCRM focuses on the basic research on the science and technology of SCRM and contrasts to the already existing studies on safety which mainly concerns with the on spot investigations for the accidents of the real firms.

In the modern days, the activities of the science and technology have become gigantic and complex. This fact has then produced the danger if the society of the human beings faces the accident which destroys the safety of the society completely. Because the modern society is formed of multielements which are complexed with each other, any accident in one part of the firm or in one local geological area produces effects upon other parts, or other areas and brings fatal damage of the whole body of the society. The scope of SCRM must be broad and must be handled generally with the cooperation of researchers of different, multi-fields. This is the reason why we have organized this symposium calling upon the participation of the researchers of the international and interdisciplinary affiliations. It must be noted that the participants here are not the simple assembly of the scientists who have just come by invitation, but you are the researchers who see the necessity of the study of SCRM which can only be carried out on the basis of international

and interdisciplinary cooperation. This situation will also brings the basis for our statement of "new" with our study on SCRM.

The study on the safety control and risk management may be defined as that on the science and technology for the safety loss prevention. It may be more concretely described in terms of the scheme of SCRM which holds the elements of I, the information, K, the knowledge, and A, the application as shown in Fig. 1. In the facets of the scheme, AI, the artificial intelligence and the human factors must also be included.

With respect to I, we have to refer to the experimental side of the science and technology for the access of data, where the improvement of the sensitivity and the resolving power of the sensors, invention of the intelligent sensors, or the production of the effective sensing systems must be involved. On these respects, sciences of analytical chemistry, applied physics and of computer science must work well. Furthermore, the contributions of the theoretical sides of mathematics, physics are indispensable.

The data which are experimentally accessed are analyzed on the basis of theoretical physical sciences and form the domain of I. Those data are compared to the standardized values of the normal phase and evaluated with respect to the viewpoint whether they are normal or abnormal. By the latter evaluation, the data in the domain of I are classified according to the classification rule and stored in the ordered manner in the domain of knowledge, K. As those data are placed in the domain of K, they form the database, where the science and technology of the database management system, DBMS, must work. Because of the fact that the evaluation of the accessed data with respect to the point of the normality/abnormality much depends on the specific nature of the spot where the data has been accessed, i.e., the plant, the disciplinary field or the geological location, the storage of K from I must be done

separately with respect to each different field of plants, or of regions. However, at the final stage, all materials of K must be assembled and ordered in the standardized unique manner so as they can be utilized for application. Actually, this task to transform the data of the specific nature to those of general nature is not easy, but must be performed. Here we have an important problem of information science.

Application of the data in K must be applied for the purpose of SCRM. Thus, a field of application, A, is created where the science and technology of the diagnosis, the design of the diagnosis of the plants are to be developed. This type of the work requires the consideration for the different specific nature of the demands of each plant of different fields and of different regions.

For the latter consideration, the human factors or the social factors come in as the important factors to be discussed.

According to the situation of the developments of the information science, the artificial intelligence, AI, should play the important role in the study of SCRM.

All these are the elements which should form the study of SCRM. The science and technology of SCRM could be defined as the total science and technology which coordinate all these elements as described above in Fig. 1.

Nextly, the present author would like to raise two points as the most important features of the science and technology of SCRM. The first one is the necessity of the parallel access, and the simultaneous evaluation of the data, and the second is the necessity of the correlation analysis. The two points cited above are related together and not indifferent from each other.

The first point of the necessity of the parallel access and the simultaneous handling of the data is obvious. Because

the final object of SCRM is the SCRM of the whole body/system under inspection. This means that all data which are accessed by all means of the monitoring parts, or the system or the paths must be handled in parallel altogether. In order to carry out these tasks of the parallel data access and the simultaneous evaluation, we need special consideration for the design of the computer system which drives the monitoring or diagnosis system of SCRM. The significance of the latter statement would be clear if one sees the present situation of the normal work of the computers living at present. They are operated on the principle of the sequencial work, one work after one on one spot. This is completely different from the work to be done in SCRM. It would be very necessary for us to work out for the creation of a new computer system which allows the parallel data access and the simultaneous evaluation, i.e., the computer system which fits to the diagnosis of the plants, the system for SCRM.

The second point relates with the first point deeply. The essential point of the SCRM seems to lie in the fact that the system of SCRM must rely in general on the work of the multichannel monitoring system. Failure or any error on one monitoring system/path may be amenable. Even if it is not amenable, we have to admit saying that we can not completely eliminate the occurrence of the failure or any error in one path or in one monitoring system. We must prevent the occurrence of multifailures. For that, monitoring of the occurrence of the correlation of the failures or the abnormalousness in the double or the multipaths must be important. This is the basis of the statement of the second point.

At this stage of the present talk, I would like to point out that the real target of the investigation on SCRM would be to invent the most efficient means to detect "correlation".

On this respect, I would like to refer to some

experimental evidences for the fact that the noise level of any monitoring system is enhanced when correlation starts in the path. Experimental findings have been published.[1] On this respect for the study of correlation, I would like to point out, furthermore, the necessity to ask for the wisdom in the history for the study of correlation in SCRM.

A study of correlation has been carried out in great depth and width, theoretically and experimentally. Although the correlation has been well studied, it can not be denied from a fundamental point of view that such a study is phenomenological and that very little or almost nothing is known concerning the real motive force or reason which produces correlation. Our knowledge regarding correlation is simply that things happen after a correlation occurs. What we need for safety management is guiding knowledge in order to avoid safety loss. During the course of our study over the last two years on safety management, it came to my mind that any analysis of empirical expertise, such as the Japanese traditional games of "Go", "Shogi" or even "Renju", would be helpful for us to construct knowledge base on correlation. Efforts for such an analysis are being carried out in the Research Institute for Information and Knowledge with the cooperation of several colleagues including Dr. Tsutomu Oguni and Mr. Natsuhiko Nagumo.

We hope that the knowledge could be established by the consultation with the historical wisdom and work to support the artificial intelligence for the diagnosis or SCRM of our society.

1) S. Fujiwara, Anal. Sci., 4, 123(1988).

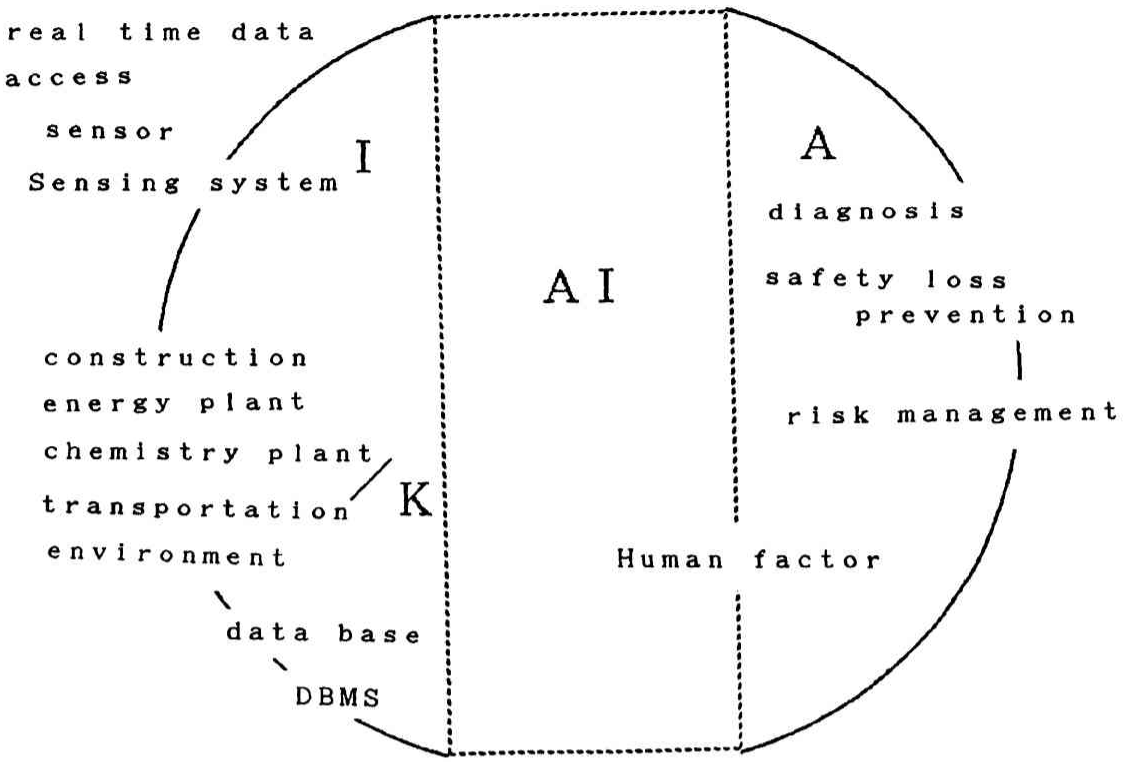

Fig.1 Schematic Presentation of the Components of SCRM