

Information Theory

Sampling Theorem

Computing Method for Communication Channel Capacity

Multiterminal Information Theory

Code Modulation Method

Information Spectrum Theory and Development

Application of Information Theory

Information theory was originated by Shannon in 1948. This new discipline was then introduced to Japan soon after the end of World War II. In 1952, an information theory study group was set up in the Institute of Electronics, Information and Communication Engineers (IEICE).

In Japan, the first achievement in this field was the sampling theorem published by I. Someya in 1948. Although Shannon was the first person who applied the sampling theorem to the transmission of information and signal processing, it is worthy to note that a similar result was obtained around the same time in Japan. In the 1980s, when the practical realization of digital signal processing started, the sampling theorem was widely studied and sampling theorems which used past sampling values alone were proposed. Meanwhile, the iterative computation method for the communication channel capacity developed by S. Arimoto in 1972 can be named as a world-first achievement in information theory within the framework of Shannon's theory.

In the 1970s, multiterminal information theory, which deals with the coding problem of communication channels with multiple information sources or multiple input-outputs, advanced in Europe and the United States. Studies of multiterminal information theory in Japan started from the latter half of the 1970s, starting from the attainable area of the interference channel by T. Han, et al., followed by the problem of statistical inference using the results of the coding of multiple information sources by S. Amari, and the code construction method for correlated multiple information. These findings significantly contributed to the development of the said field. In addition, in 1977, the multilevel code modulation method using error-correcting codes was proposed by H. Imai and S. Hirakawa and this became the pioneering work of the code modulation method which integrally deals with coding and modulation.

In the 1990s, information spectrum theory was proposed by T. Han as a framework for information theory in unsteady or non-ergodic information sources and communication channels. Active studies about the basic amount of information in the information spectrum

method are going on even today. Recently, studies in new fields such as the application of information theory for the asymptotic properties of energy expressions for power packets have been going on.