

Non-linear Theory

Finding of Chaos Phenomenon

Analytical Method for Non-linear Systems

Numerical Calculation Method with Accuracy Assurance

The discovery of chaos in the field of non-linear problems in 1961 by Y. Ueda, later made a significant global impact to sciences ranging from basic science, i.e., mathematics, physics, and chemistry to engineering applications. As to the discovery of the said chaos, he scientifically identified chaos as a physical phenomenon through analog circuit experiments. He published his paper in the IEICE journal.

As an analytical method for non-linear systems, from the perspective of non-linear functional analysis, K. Horiuchi constructed a theoretical system to analyze the global characteristics of various non-linear systems. In addition, K. Horiuchi and Y. Endo proposed a unique analytical theory using fuzzy mappings for systems with uncertainty, thereby advancing studies concerning the reliability and safety of these systems. Meanwhile, S. Oishi provided a new research direction – computer-aided analysis of the boundary-value problem for non-linear differential equations.

Later, in the field of the numerical calculation method, S. Oishi, overturned the common thinking in the field of numerical calculation methods that it was practically difficult to get a mathematically correct answer, proving the existence of a solution for equations with almost same amount of calculations as that of the approximate calculation. In addition, he established the numerical calculation method with accuracy assurance which guarantees the fact that calculation is only correct up to the required digits through the numerical calculation.