

Results on research activity

I engaged mainly in studying knot theory and low dimensional manifolds of topology. In particular, I studied Alexander polynomial, topological imitation theory and surfaces in the 4-dimensional space, etc. Among earlier works, there is a solution of the non-invertibility problem on the knot 8_{17} proposed by R. H. Fox, which has been the unsolved problem for 50 years. This result was done in the study of Alexander polynomial during the 2 academic year stay at the Institute for Advanced Study, Princeton.

In recent years, I started a study of a model in psychology using a knot and a study of a spatial graph to apply to string-shaped materials, called soft matters (Macromolecule, DNA, etc.) as applications of knot theory and topology. As a result, the game "Region Select" applying knot theory (developed with colleagues) was shown at the world same time in the Android market.

In 1983, I started a joint seminar "KOOK seminar" organized by the knot theorists of 4 universities in Kansai, Kobe University, Osaka University, Osaka City University, Kansei Gakuin University. This became a driving force of the development of the knot theory study in Kansai and later in Japan. In particular, "Knot Theory" (Springer Verlag Tokyo, 1990) was published in Japanese as the first book of the whole knot theory in Japan under co-operations with KOOK Seminar members. Later, the English version "A Survey of Knot Theory" (Birkhäuser, 1996) was published abroad and gave knot theorists in the world an impact. KOOK Seminar develops into "N-KOOK Seminar" joining Nara Women's University, which plays a central role of studying knot theory in Japan afterwards.

From April 2003 to March 2008 I was a program leader of the 21st COE program "Constitution of wide-angle mathematical basis focused on knots". With this, I made an effort to establish Osaka City University Advanced Mathematical Institute (OCAMI).

In the research area of education, I made an effort for introducing knot theory to school students and played a leading role in a study group of Osaka Kyoiku University. The result was settled as the text book "Teaching and learning of knot theory in school mathematics", the first book of English mathematics education.

On the international exchange side, I sponsored the international conference "Knots 90", the first knot theory conference in the world August, 1990. Then together with Professor Mitsuyoshi Kato of Kyushu University and Korean researchers, I sponsored the knot school "The Japan-Korea School of Knots and Links", held every year from 1992 between Japan and Korea. From February 2004, this school develops into "The East Asian School of Knots, Links and Related Topics" joining Chinese researchers, whose ninth meeting was held in Tokyo January 2013.