

Research achievements

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Warping degree of a knot diagram

The study of an alternating knot is very important in knot theory. The warping degree of an oriented link diagram is defined by Kawachi, and used for calculating polynomial invariants of knots. I showed in [1] an inequality which is about a relation between the warping degree and the crossing number of an oriented knot diagram, and showed that the equality holds if and only if the diagram is alternating. This means the warping degree is useful for the study of alternating diagrams and alternating knots. In [1], I also defined a knot invariant via the warping degree, and showed an inequality about the invariant and the crossing number of an oriented knot, where the equality holds if and only if the knot is prime and alternating.

Warping degree and the warp-linking degree of a link diagram

In [2], I generalized the results in [1] for a link, and defined the warp-linking degree of a link diagram which is like a restricted warping degree. I showed an inequality about the warp-linking degree and the non-self crossing number of a link diagram, where the inequality holds if and only if the link diagram is equilibrated (cf. [2], [4]).

Complete splitting number of a lassoed link

In knot theory, the splittability is one of basic concepts. In [3], I defined lassoing, which is a local move on a link diagram or a link, and showed the upper bound and the lower bound of the complete splitting number of a lassoed link. From the result, the complete splitting number of a link which is obtained from any knot by r -iterated lassoings is just r , and by lassoing, we can construct a link which is algebraically completely splittable and whose complete splitting number is r . I showed in [3] formulae for the Conway polynomial and the Alexander polynomial with respect to a lassoing.

Region crossing change and the region unknotting number

In [5], I gave the positive answer for Kishimoto's question which asks "is a region crossing change on a knot diagram an unknotting operation?" Then I defined the region unknotting number of a knot diagram or a knot, and showed that for any non-negative integer n , there exists a knot whose region unknotting number is n . I also showed a relation between the region unknotting number and the crossing number of a knot.