Results of my research
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I studied Heegaard splittings and Dehn surgeries. Recently, I'm interested in the topology of DNA and proteins, and I gat some results. Here, I show details of my research. The number of paper below is corresponding to that of the paper lists.

● Heegaard splitting

On the paper [1], we defined the types for the Heegaard splittings, and discussed a relation between each Heegaard splitting of each type. In particular for two component links, for each type, we showed the existence of links that do or do not have a Heegaard splitting of the type. The study of Heegaard splittings of knots exterior exactly corresponds to the study of unknotting tunnels of knots. The number of unknotting tunnels is called a tunnel number of knot. For tunnel number one knots, Cho and McCullough show that pares of knots and their unknotting tunnels are completely parameterized by sequences of rational numbers and sequences of 0's or 1's. On the paper [5], we discovered an algorithm for finding the parameter of given tunnel. For two given tunnels of a knot, we can recognize they are equivalent or not by this result.

● Dehn surgery

On the paper [3], we show that we can obtain a trivial knot from a knot with its meridian by band sum if and only if the knot is unknotting number one. This result relates to the study of Dehn surgeries along knots yielding Seifert fibered spaces.

On the paper [4], we obtained two results on Dehn surgeries along links yielding the 3-sphere. One is the existence of infinitely many tunnel number one links having six Dehn surgeries yielding the 3-sphere. One is the existence of infinitely many pares of tunnel number one links that one link consists of non trivial knots, another one has a trivial component, and their exteriors are homeomorphic to each other.

● Topology of high polymer

It is a problem how many base pairs necessary to construct a knot by DNA or protein. The lattice knot is one of good models for that. The length of lattice knot is called a minimal step number. On the minimal step numbers, it is shown that 3_1 is 24 by Diao, and that 4_1 is 30 by Yamaguchi. On [9], we reported that minimal step number of 5_1 is 34. On paper [2], we showed that theoretical algorithm for recognizing the minimal step number of general knot. Moreover, we gave upper bounds for knots up to 10 crossings.

Recently, on site-specific recombinations of DNA, it is problem to characterize the reaction by using the topology. On the paper [6], we characterize band surgeries from genus one 2-bridge knots to

(2,2k)-torus link. We characterized some site-specific recombination of DNA by this result.