Plans of my research

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I have classified spatial graphs up to ambient isotopy, and believe that my work is the latest frontiers of θ-curve and handcuff graph tables. Hereafter, I am planing to make a table of all the prime θ-curves and handcuff graphs with more than seven crossings. I also consider making a table of spatial 3-valent graphs embedded in S^3. In particular, since a complete graph on four vertices has four 3-valent vertices, I try to make it.

In order to do such things, I must work on the followings: First, I enumerate algebraic tangles with more than seven crossings. By going ahead with my method (see a list of my papers [2]), I can obtain results. Second, I construct prime basic θ-polyhedra with more than seven 4-valent vertices or planar graphs with four 3-valent vertices and some 4-valent vertices. To construct them easily, I will work not only by hand but computer. Third, I substitute algebraic tangles for 4-valent vertices, and obtain those 3-valent spatial graph diagrams. Finally, I classify those 3-valent spatial graphs up to ambient isotopy. For θ-curves and handcuff graphs with up to seven crossings, the Yamada polynomial is very useful to classify them. However, I do not know how powerful the Yamada polynomial for θ-curves and handcuff graphs with more than seven crossings or complete graphs on four vertices. I would like to research this question. Moreover, I would like to study an invariant which can classify those 3-valent spatial graphs.

There do not exist so many results about handcuff graph. Recently, T. Motohashi proved a prime decomposition theorem for handcuff graphs. By this theorem, every nontrivial handcuff graph can be decomposed into a finite number of prime θ-curves and handcuff graphs. Moreover, they are uniquely determined up to order and equivalence. However, I do not know how to conclude the primeness of a handcuff graph. In my handcuff graph table (see a list of my papers [4]), I omit handcuff graphs which can be decomposed obviously. Then in order to prove the primeness of them, I would like to study this question.