別紙４－１ （課程博士（英文））

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Abstract （Doctor）

Title of Thesis	Stable Matching under Dynamic Preference

Approx. 800 words

We studied two-sided matching with dynamic preference. One of the most well-known problems in two-sided matching is the Stable Marriage Problem (SMP). An instance of SMP is $I = (M, W, L)$, where M and W is a set of men and women agents, respectively, and L is the preference list of each agent in $M \times W$. In classical SMP, a matching is said to be stable if there is no blocking pair found. A blocking pair is formed of a man m and a woman w who are not partners in a matching M but prefer each other over their current partners. The stable matching problem with dynamic preferences is near to the real-world situation problem, where an agent is allowed to change his/her preferences at any time, affecting the stability of a matching. In this study, we propose two strategies to maintain the stability of a matching problem with dynamic preference, namely short-term and long-term stability.

Short-term stability is a strategy to maintain matching stability by updating the matching every time the preferences change. A simple way that can be done on the short-term stability strategy is to start the matching process using the Gale-Shapley algorithm from scratch. However, the preference changes in the matching problem do not always affect the existing stable matching. Sometimes the preference changes do not trigger a forming of a blocking pair in obtained matching. Based on this reason, we propose a mechanism for updating matching by observing the preference changes of agents. We try to minimize the process of finding stable matching by following the preference changes that occur. Thus, the update matching process must not be done from scratch. Our theorems show how to update the matching by observing the preference changes. Thus, the process of finding a stable matching can be shortened.

The second strategy is to find long-term stability, which is to maintain the stability of matching over a long period. We assume that preference changes frequently occur. Employing a short-term strategy to maintain stability would be costly. A classical SMP instance is $I = (M, W, L)$. In the SMP with dynamic preference, agents can change their preferences, leading to dynamic preference. An instance of SMP with dynamic preference leading the formation of a dynamic instance. The dynamic instance is $DI = (M, W, L_1, L_2, ..., L_k)$, where k is the number of unique preference lists that occur due to changes in agent preferences. Thus, a set of SMP instances for SMP under dynamic preference is $DI = \{I_1, I_2, ..., I_k\}$. We introduce a new concept to find stable matching under dynamic preference using the blocking pair perspective. We also define three notions of stability for a matching problem under dynamic preference. Our proposed concept demonstrates a more detailed result than the existing concept. With more detailed results, decision-making in determining stable matching becomes more precise.