

# Research Plan

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I have three ongoing research projects.

The first one is to study injective homomorphisms between finite index subgroups of the mapping class groups of surfaces. In order to deepen our knowledge about such injective homomorphisms, I will investigate how injective homomorphisms from pure braid groups are restricted from the topological point of view. In this regard, I found that the embedded image of each generator of a pure braid group in the mapping class group of a low genus surface is “reducible” and of specific form. I would like to generalize this fact.

(Joint work with Erika Kuno) The second one is to define the marking complex for a non-orientable surface and to find its application. The marking complex for an orientable surface is defined by Masur–Minsky, and this complex played an important role in their theory on the mapping class groups of surfaces. For example, the Cayley graph of the mapping class group of an orientable surface is quasi-isometric to the marking complex. For some technical reasons, the study of the mapping class group of non-orientable surfaces is rather undeveloped. Therefore we plan to define the marking complex for a non-orientable surface. About this plan, we first proved the bounded geodesic image theorem for non-orientable surfaces with effective bounds. We next study the action of mapping class groups on the pants complexes.

The last one is to apply the theory of bicorn curves to the study of disk graphs in order to yield an explicit hyperbolic constant of disk graphs. I would like to apply our research to the theory of 3-manifolds in the future.