

## Abstract for our study

### 1. Our study on line configurations in complex planes

Let  $l = l_1 \cup \dots \cup l_\mu$  be a collection of lines in  $\mathbf{R}^2$ . Then  $l$  induces a real line configuration  $L = L_1 \cup \dots \cup L_\mu$  in  $\mathbf{C}^2$  and a real line configuration  $\mathcal{L} = \mathcal{L}_1 \cup \dots \cup \mathcal{L}_\mu$  in  $\mathbf{CP}^2$ .

First we describe our study on a real line configuration  $\mathcal{L}$  in  $\mathbf{CP}^2$ . We proved the following results concerning the first Betti numbers of abelian coverings of  $\mathbf{CP}^2$  branched over real line configurations:

- (1) An estimate of the first Betti numbers .
- (2) A characterization of a central and general position line configurations in the terms of the first Betti numbers of abelian coverings.
- (3) The first Betti numbers of the abelian coverings of the real line configurations up to 7 components.

Next we describe our study on a real line configuration in  $\mathbf{C}^2$ . For a real line configuration  $L$ , we construct a ribbon surface-link which has the same group as  $L$ . If  $L$  is a central or general position line configuration, the genus of the constructed ribbon surface-link is the smallest of all the genera of the ribbon surface-links with the same group as  $L$ .

### 2. Our study on links in the three dimensional sphere

First we describe our study on 2 component links. We give a formula to express the first homology groups of the  $\mathbf{Z}_2 \oplus \mathbf{Z}_2$  branched coverings of  $L = K_1 \cup K_2$  in terms of those of three smaller cyclic branched coverings.

Next we describe our study on a table of manifolds. A. Kawauchi defined a well-order on the set of links, which induces a well-order on the set of link groups, and which eventually induces a well-order on the set of 3-manifolds. In fact, he enumerated the first 28 prime links, the first 26 prime link groups and the first 26 closed connected orientable 3-manifolds. We extended the prime link table from 28 to 444, the prime link group table from 26 to 400 and the manifold table from 26 to 346.