

Low dimensional topology

Hiroko MURAI [Mathematics Course]

My main research subject is low dimensional topology. Especially in recent years, I study the following topics.

1. Knot theory is one of the important research fields in low dimensional topology, and various invariants have been created to advance researches. Since 1984 when V. Jones discovered the Jones polynomial, a knot polynomial which is an invariant of an oriented knot or link, relations with mathematics other fields and physics have been discovered one after another. In the late 1990s, Khovanov discovered Khovanov homology which is may be regarded as a categorification of the Jones polynomial, on which a lot of applications have been found. I'm interested in categorify other polynomials of knots and graphs.
2. A knot is a simple closed curve embedded in a three-dimensional space, and we can obtain a closed curve on a curved surface by projecting it on a surface, that is, by considering a shadow. Recently, I am also interested in classifying such closed curves by natural deformations corresponding to moves on knots.
3. Origami, which was traditional Japanese paper folding, now spread all over the world. In recent years, applications to various fields such as space engineering and architecture have been found, and the problem of whether it can be folded flat or rigidly is attracting attention from the application point of view. I am trying to comprehensively understand such problems using mathematical methods.

Keywords : Knots and links, Closed curves on surfaces, Categorification of knot or graph polynomials, Geometry in Origami