RESEARCH ACHIEVEMENT

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The applicant has been conducting research on minimal surfaces in the Euclidean 3-space for many years, focusing particularly on flux. The inverse problem of the flux formula, or Plateau problem at infinity, previously proposed by several researchers including Rosenberg and Kusner, asks whether a complete minimal surface with only embedded ends, so-called an n-noid, exists, which realizes a set of flux vectors whose sum is zero. In collaboration with Umehara and Yamada [6], [8], [9], [13], [14], the problem was refined by decomposing the flux vectors into limit normals and weights, and results regarding the general existence of a solution were obtained.

Subsequently, in collaboration with Kenji Nomura [16], [17], we further decomposed the weights of ends of an n-noid into relative weights defined for each pair of ends, and applied them to the analysis of the degeneration or collapse of n-noids of genus 0, in other words, that of the structure of the moduli space of n-noids of genus 0, particularly its boundary. In collaboration with Hisayoshi Muroya [19], [20], we formulated the above problem for n-noids of genus 1, in collaboration with Kosuke Tatemichi [21], we described the relationship between flux, index, and nullity, and in collaboration with Kohei Hamada [23], we constructed the first examples of a non-orientable n-noid consisting only of catenoidal ends. Furthermore, in [25], we constructed many new examples of non-orientable n-noids consisting only of planar ends, including examples with symmetries different from those known by Kusner.

Meanwhile, in collaboration with Taishi Imaizumi [18], we gave a partial solution to the inverse problem of the flux formula for spacelike maximal surfaces in the Lorentzian 3-space, and also introduced relative weights and provided an analysis of the properties of fold singularities. Furthermore, in collaboration with Naoya Ando, Kaname Hashimoto, and Kohei Hamada [22], [24], we dealt with a generalized concept of flux on zero-divisor sets in bicomplex extensions, rather than the poles used in previous studies.