Determination of the Moduli of Ring Domains by Finite Element Methods

Hisao MIZUMOTO[1] and Heihachiro HARA[2]

Department of Medical Informatics Faculty of Medical Professions Kurashiki, Okayama, 701-0193, Japan[1]

Department of Medical Informatics Faculty of Medical Professions Kurashiki, Okayama, 701-0193, Japan[2]

Abstract

In the present paper we aim to establish a method of finite element approximations by which we can determine the moduli of thin ring domains and thick ones with critical boundary points. Our method matches the abstract definition of Riemann surfaces, and also will offer a new technique of high practical use in numerical calculation. It is characteristic of our method that we adopt ordinary triangular meshes and linear elements on a subregion of an image by a local parameter of every fixed parametric disk, our approximating functions satisfy the boundary conditions exactly even in the case of curvilinear boundary arcs, and express singular property exactly near critical boundary points. Hence the approximations of high precision are obtained, and the fairly good upper and lower bounds to the moduli can be evaluated. It should be noted that we do not adopt any so-called refined or curvilinear mesh near critical boundary points.