

Summary

In this paper, the inverse problems in a multiply connected domain governed by the Laplace equation have been investigated numerically by the developed moving modified Trefftz method. When solving the direct Laplace problem with the conventional Trefftz method, one may treat the ill-posed linear algebraic equations because the solution is obtained by expanding the diverging series; while when the inverse Laplace problem is encountered, it is more difficult to treat the more seriously ill-posed behaviors because the incomplete boundary data, and its solution, if exists, does not depend on the given boundary data continuously. Even many researchers have proposed lots of methods to overcome the ill-posed problem; however, an effective numerical scheme to tackle the problem is still not available. It is interesting to note that the characteristic length concept is introduced into the conventional Trefftz method and thus, it leads to a better numerical accuracy and stability. Besides, this method can effectively deal with the multiply-connected domain problems with the combination of moving Trefftz method even when the domain boundary is arbitrary. More noteworthy is that this proposed approach can handle the inverse problems even under disturbed boundary data. Several numerical examples are provided for validating the present approach.

keywords: Inverse Laplace problem, modified Trefftz method, moving Trefftz method, ill-posed problem, collocation method, characteristic length, multiply-connected domain.

