

# The Interior Field Method for Laplace's Equation on Circular Domains with Circular Holes

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## Abstract

The new interior field method (IFM) is proposed, which is a special case of the null field method (NFM) when the field nodes are just located on the domain boundary. The IFM is simpler than the NFM, because only one Green formula of interior solutions is needed, compared with multiple Green formulas used in the NFM. Note that all the computations of the NFM by Chen's group are, indeed, obtained from the IFM in this paper. Then the IFM is more advantageous in simplicity and application. Since the IFM can also be regarded as a kind of Trefftz method (TM), the error analysis is easy and the optimal convergence rates are derived in this paper. In contrast, the error analysis of the NFM is rather complicated and troublesome. Numerical experiments are provided to support the analysis.

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