

AN APPROACH FOR REDUCING THE ERRORS IN THE FICTITIOUS DOMAIN METHOD

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Fictitious domain methods reduce the complexity of meshing a domain by using an extended auxiliary region and augmenting a functional to implement the original boundary conditions in the extended domain. Such methods are particularly attractive for moving boundary problems and a variation of these techniques is based on using Lagrange multipliers. The problem at hand is discretized using finite elements. In this method, the multipliers do not necessarily enforce the boundary conditions at nodal locations and may fall within elements. The presence of a multiplier within an element introduces significant errors on the adjacent nodes when the boundary condition enforced involves a discontinuity of the first derivative of the solution. The errors introduced are linked to the location of the multiplier within an element and the element size. A simple two-step predictor/corrector method is proposed to mitigate the errors and enforce a new boundary condition that is found to significantly reduce the errors in the solution. The method is tested on simple two dimensional heat transfer problems.