# An Unfitted Finite Element Method for the Approximation of Void Electromigration

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## Abstract

Microelectronic circuits usually contain small voids or cracks, and if those defects are large enough to sever the line, they cause an open circuit. We present a numerical method for investigating the migration of voids in the presence of both surface diffusion and electric loading. Our mathematical model involves a bulk-interface coupled system, with a moving interface governed by a fourth-order geometric evolution equation and a bulk where the electric potential is computed. Thanks to a proper approximation of the interface, equidistribution of its vertices is guaranteed, therefore no re-meshing is necessary for the interface.Numerical challenges include the coupling of the two sets of equations and the proper definition of the bulk mesh at each time step: the algorithm used to identify cut, inside and outside elements, as well as local adaptivity are explained in detail. Various examples are performed with a C++-based code to demonstrate the accuracy of the method.

## References

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