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Higher order isoparametric unfitted space-time finite element methods for problems involving moving domains

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In many computational problems arising in important applications from physics, biology, chemistry and engineering complex and evolving geometrical shapes play a major role. These geometrical shapes may exhibit topology changes or strong deformation which makes the numerical treatment very challenging. The methodology of unfitted finite element methods, i.e. methods which are able to cope with interfaces or boundaries which are not aligned with the grid, has been investigated for different problems. However, the development of numerical methods which are flexible with respect to the geometrical configuration, robust and *higher order accurate* at the same time is still challenging.

One major issue in the design and realization of higher order finite element methods is the problem of accurate and stable numerical integration on time-dependent level set domains. We present an approach which allows for a higher order accurate and robust numerical treatment of domains that are prescribed by level set functions [1]. The approach is based on isoparametric mappings that are specifically tailored. We combine this approach with a space-time discretization to obtain *robust* higher order methods in space and time [2].

The space-time method, its conception, implementational aspects, a priori error estimates and numerical results will be discussed.

REFERENCES

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