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# THE FINITE CELL METHOD FOR ARBITRARY TETRAHEDRAL MESHES: SMART STRUCTURE APPLICATIONS

**Sascha Duczek, Ulrich Gabbert**

*Otto-von-Guericke-University Magdeburg, Germany*
*sascha.duczek@ovgu.de ; ulrich.gabbert@ovgu.de*

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**Summary:** The need for body-fitted meshes is the main drawback of conventional and also high-order Finite Element Methods (FEM). The generation of a suitable discretization, however, is a rather involving and error-prone process that requires a lot of user input. The Finite Cell Method (FCM) circumvents the aforementioned problem by applying the Fictitious Domain Concept (FDC) [1,2]. Exploiting the FDC results in regular Cartesian grids where the actual geometry of the component is resolved by means of an indicator function for the numerical integration of the system matrices [2,3].
In the context of industrial applications it is not always possible to obtain a waterproof representation of the surface of the component under investigation. The main ideas of the current paper are therefore (i) to re-use existing FE grids and (ii) to include important micro-structural details only in regions of interest (RoI) by means of the FDC. The micro-structures of the RoIs are obtained using high-resolution computed tomography (CT) scanners. They are inculded into the numerical model either by using voxelized data or surface tessellation language (STL) files. Therefore, the effects of pores and other micro-structural features can be easily investigated in parametric studies. In the current paper a focus is put on smart materials with piezoelectric properties. The performance of the proposed approach is , accordingly, tested deploying several examples using piezoelectric transducers.

## References

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