The periodic unfolding method for a class of imperfect transmission problems

Kim Hang Le Nguyen, Patrizia Donato, and Roland Tardieu

The periodic unfolding method was introduced by D. Cioranescu, A. Damlamian and G. Griso in [1] for studying the classical periodic homogenization in fixed domains and more recently extended by them, together with P. Donato and R. Zaki, to periodically perforated domains in [2].

In our work, the method is adapted to two-component domains which are separated by a periodic interface. The first component is connected (like perforated domains) and the second one is a disconnected union of periodic sets (like the zone usually occupied by periodic holes). We introduce a second unfolding operator, acting on functions defined in the disconnected part, and study its main properties. Moreover, we study the relationship between the two operators and in particular the properties of their traces on the common boundaries.

The unfolding method is then applied to an elliptic problem with a jump of the solution on the interface, which is proportional to the flux and depends on a real parameter. We prove some homogenization and corrector results, which recover and complete those previously obtained in [3] by the first author and S. Monsurrò.

The results have been recently published in [4].

References

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