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THE LOCAL RESPONSE IN STRUCTURES USING THE EMBEDDED UNIT CELL APPROACH

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This paper describes the development of a new concept for the homogenization of non periodic response. This type of formulation is required 1. for non-scalable structures (graded material), since the material unit cell (*micro-scale*) is comparable in size to the structural scale (*macro-scale*), e.g., concrete beams, slabs etc. [1] as shown in Figure 1 which depict a concrete unit cell embedded within a concrete beam; 2. for damage analysis where fractures are expected and therefore the assumption related to the periodic nature of the unit cell cannot hold.

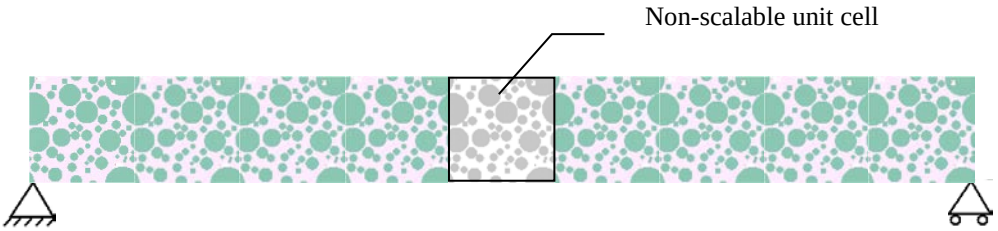

Figure 1: *The non scalable multi-scale modeling scheme of a concrete structure*

The EUC approach is based on a non-periodic multiscale formulation with alternative boundary conditions. We are suggesting achieving that by surrounding the stress concentration domain (unit cell) with an appropriate continuum domain. This surrounding domain appropriately accounts for the boundary conditions, required to represent the response at the vicinity of the stress concentration domain using a unit cell model (micro-scale model). In the suggested EUC approach, we are using this unit cell models in a multi-scale scheme to homogenize the stress concentration domain (unit cell models) and up-scale its properties to the macro-scale (structural) model. Finally verification study is presented.

REFERENCES

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