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Meshfree simulation of compressive damage in concrete cubes

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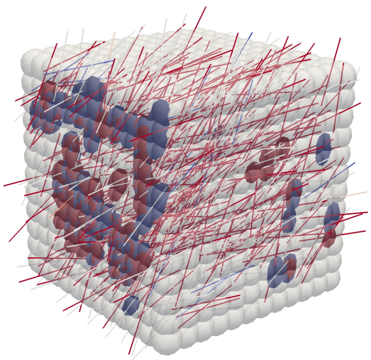
We develop a meshfree methodology to model compressive damage in quasi-brittle materials. The exponential shape functions are stemmed from the max-ent principles [1] and endorsed with an adaptive nature coined as DAAS (deformation-attentive approximation schemes) [2]. Material point sampling and Gauss point integration are carried out to avoid possible numerical instabilities caused by usual nodal integration schemes. A novel fragmentation algorithm is established for the insertion of failure surfaces, which can represent tensile fracture or compressive damage. The location and orientation of such surfaces are the result of the eigenvalue analysis of the deformation gradient tensor, and are not restricted by the level of numerical integration. A cohesive law governs the constitutive behaviour of the failure surface, which information is embedded in a cohesive Gauss point.

The methodology is employed to model the compressive damage in unconfined cubes made from high strength concrete, plain and reinforced with steel fibres. Global load-displacement curves and failure patterns are compared with the experimental counterparts. The agreement is remarkable.



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