Use of maximum entropy shape function within a strong meshfree formulation.

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ABSTRACT

In the past years, in the context of the meshfree method (MF), it has been established a clear predominance of the methods based on a Weak or Galerkin Formulation (WF) over the methods based on a strong formulation (SF). This has been mainly motivated for the fact that the WF has resulted in a more stable methodology, and the only problem present in these methods are the scheme and domain of integration. In the case of SF the situation is completely different, because they have had to deal with the problem of instability and not robust. One of the major factors responsible for this, is the differential operator which is characterized as an error amplifier. Another drawback of such methods is the difficulty of imposed the Neumann Boundary Condition or Derivative condition, which involve another equations group different that those obtained for the domain. This problem has been reported for many authors. Among the solutions proposed to deal with these issues of instabilities on SF, the principal line of propose is how the local subdomains for the approximation are built, which has led to positive results in some particular case. For this, in this work we present a different type of solution consistent in the use of a different shape function of the traditional weight least squares (WLS) on SF. This shape function is obtained from the Maximum Entropy Principle (MAXENT), which have been used in various fields, including the use as a shape function in the context of WF. The main interesting features from the point of view of SF, correspond to the fact that the value of the shape functions are always positive and smooth, in addition to have a reducing property on the boundary of the domain. These things are important because at least the first positivity criterion proposed for Patankar for shape functions used on SF is fulfilled. To prove this alternative, several examples in Linear Elasticity are shown and is possible to watch the correct behaviour of this methodology on a strong formulation.

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