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# 裂纹扩展问题的改进XFEM算法

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# AN IMPROVED ALGORITHM OF XFEM FOR THE CRACK PROPAGATION PROBLEMS

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摘要

利用扩展有限元法计算裂尖附近应力、位移场,进而得到裂尖应力强度因子和开裂角;水平集法描述、追踪裂纹,并由单元结点水平集值判别单元类型;将二者结合起来分析处理裂纹扩展问题。针对水平集判别倾斜裂纹单元类型的不足,分析问题的原因,并给出解决方案。最后,通过典型算例分析,表明将扩展有限元法与水平集法结合分析裂纹扩展问题时具有不需网格重构,裂纹与网格相互独立的特点;同时验证了笔者提出解决方案的准确性和可行性。

关键词: 扩展有限元 裂纹扩展 水平集法 加强单元 应力强度因子

Abstract:

Based on the extended finite element method and level set method, the crack propagation problem is modeled. The extended finite element method is also used to compute the stress and displacement field near the crack tip in order to determine the angle of the crack propagation. The level set method is used to represent the crack interface and the location of the crack tips, and to track the crack propagation paths. In the practice, there are some limitations judging the element types. The reason is the limitation of the level set method in judge the element types. Thusly, the advantage project which called the virtual crack method is come up. At last, two typical numerical examples are simulated for the crack propagation problems. This combined method requires no remeshing as a crack propagating, making the algorithm very efficient, and the results are present to demonstrate the accuracy of the advantage project.

Key words: extend finite element method level set method crack propagation enrich element stress intensity factor

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