

一种新的岩体力学数值计算方法——叠单元法

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摘要 提出了一种新的岩体力学数值计算方法——叠单元法。首先, 对含多条不连续面的复杂岩体, 将其离散成不含不连续面的整体网格和各条不连续面及其邻近区域的局部网格, 而且网格之间相互独立。位移场通过在各网格中插值并叠加得到。然后, 由虚功原理推导出了整体平衡方程中的广义刚度矩阵和荷载向量的具体表达式, 并对其数值积分方法进行了讨论。最后, 分析了2个平面应力问题的算例, 且通过与有限单元法的计算结果进行对比, 验证了叠单元法的准确性和合理性。叠单元法的最大特点是可以将复杂岩体的网格划分工作分解成几个相互独立的简单网格, 从而使网格离散变得简便易行。该方法可以直接推广到三维问题和非线性问题中, 因此, 有望广泛应用于复杂岩体的变形与稳定分析。

关键词 [岩石力学](#); [叠单元法](#); [岩体](#); [不连续面](#)

分类号

A NOVEL NUMERICAL ANALYSIS METHOD FOR ROCK MASSES —SUPERPOSED ELEMENT METHOD

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Abstract

Superposed element method (SEM), a novel numerical analysis method for rock masses, is proposed in this paper. At first, for the complicated rock masses containing many discontinuities, the mesh of the whole domain without any discontinuity and the mesh for each discontinuity, together with its adjacent zone, are generated separately. The displacement field is interpolated in each mesh and superposed together. Then, the generalized stiffness matrix and load vector in the equilibrium equations are formulated by using the virtual work principle, and the numerical integration method is discussed. Finally, two numerical examples of plane stress problem are studied by the new method, and the results are very close to those calculated by using FEM. The most distinguished characteristic of SEM is that its mesh generation is simplified greatly by partitioning the mesh of complicated rock mass into several separated simple meshes. The new method can be expanded to solve three-dimensional and non-linear problems directly, and is expected to be widely used in the deformation and stability analysis of complicated rock masses.

Key words [rock mechanics](#); [superposed element method](#); [rock mass](#); [discontinuity](#)

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