地铁隧道盾构法施工过程中地层变位的三维有限元模拟

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摘要　　在全面分析土压平衡式盾构施工过程中影响周围土体变形各主要因素的基础上，提出一种能够综合考虑各种因素的盾构施工三维非线性有限元模拟方法，通过对某地铁隧道盾构施工过程的模拟，分析了盾构推进过程中隧道周围及地表处土体的位移和变形以及横断面不同深度上的沉降分布规律，计算得到的隧道纵向地面沉降分布曲线与实测数据非常接近，计算结果表明所提出的盾构施工模拟方法是有效可行的。

关键词　　隧道工程；地铁隧道；盾构法；三维有限元法；地层变位

分类号

3D FINITE ELEMENT SIMULATION ON DEFORMATION OF SOIL MASS DURING SHIELD TUNNELING

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Abstract

Based on the comprehensive analysis on the primary components of ground movement associated with earth pressure balance(EPB) shield tunneling，a three-dimensional nonlinear finite element model for simulating EPB shield tunneling is proposed. The proposed numerical procedure can simulate the full excavation sequence and consider factors such as jack force behind the machine，earth pressure on tunneling face，excavation，advancing of shield，installation of lining，and backfill grouting. The proposed modeling techniques are applied to simulate a tunneling project in Shanghai. The distributions of soil displacement around the tunnel and on the ground surface associated with the shield tunneling operation are analyzed in detail. According to the comparisons of numerical results with field measurements，the proposed numerical procedure is found to be an effective approach for predicting the deformation due to EPB shield tunneling

Key words

tunneling engineering；metro tunnel；shield tunneling method；3D FEM；deformation of soil mass

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