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具有大量椭圆随机分布区域的数值模拟及应用

Numerical simulation method for the domain with large number of random ellipse grains and their applica

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中文关键词： 多相复合材料 数值模拟 混凝土试件 级配 随机分布区域

英文关键词:multi-phase composite material numerical simulation concrete specimens grading random distribution area

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中文摘要:

利用椭圆的参数方程,首先给出平面上的点位于椭圆内部与外部的判别条件,再把计算点到椭圆距离问题,化为一个求最值问题,使得可以用搜索法较快地得到有效的近似解,从到一个新的产生具有大量椭圆随机分布区域的方法,基本思想是:(1) 对于模拟区域内随机生成的点,先判断该点是否在所有已生成椭圆的外部,若是,计算它与所有已生成椭圆边界的(2) 如果所求的距离大于或等于欲生成的椭圆的长半轴,则以该点为中心,生成一个新的椭圆。这样,不必用一个多边形覆盖来判别椭圆之间是否相交或重叠,可以使生成的椭圆与椭的距离更小一些(甚至可以是零),从而提高了模拟区域中椭圆的密度。试验表明,针对混凝土,可以在比较短的时间内,按3级配生成骨料含量可高达70%以上的模拟试件,按2级配生成量可高达60%以上的模拟试件。对所生成的混凝土试件,做了简单的加载力学实验。计算结果表明,该方法生成的模型能够满足力学分析的需要;进一步,基于椭圆随机分布区域,使用为覆盖,建立了高含量的参数化不规则骨料模型试件。

英文摘要:

Based on parameter equation of the ellipse.Firstly,the discrimination method for a point in and out the ellipse plane is given,and then the problem of calculating distance between the point and the elliptic is converted into a problem of seeking the minimum,so effective approximate solution can be gotten q by the search method.Thus,a new generation method for the domain with a large number of random ellipses is obtained,the basic idea is:(1) For the points ran generated within the region,first,to determine whether the point is external to the generated ellipse,if so,to calculate the distance for it with all the bo of generated ellipse; (2) If the distance is greater than or equal to the long axle of the wanted ellipse,then to build a new ellipse with that point as the center.In this way,there is no need to determine whether intersection or overlap between the ellipses with polygon covering,then the distance between the el can be smaller (even zero),thereby increasing the density of elliptise in the simulated region.Test showed that for concrete,in a relatively short period of time,according to three grading that can generate aggregate content up to 70% of the simulated specimens,according to two grading that can generate aggregat content up to 60% of the simulated specimen.Finally,we made a simple mechanical loading experiments for the concrete specimens; the results show that the mo generated by the method can meet the mechanical analysis.Further,based on the domain with large numbers of random ellipse,the parameterized irregularly aggr mode with high content is given by the elliptical covering.

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