Computation of Finite Element Stiffness Matrix Based on Dual Neural Network Method

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1. Abstract

With the emergence of high precision and complex structural computing tasks, the precision of finite element method is put forward, and the solution of finite element stiffness matrix is paid more and more attention by scholars. Based on the principle of dual neural network, a neural network numerical method is proposed for the element stiffness matrix in the finite element of linear elasticity problem. The integral expression of the element stiffness matrix is obtained according to the minimum bit energy principle. The geometrical shape of the element and the field function in the element are transformed by the same number of node parameters and the same interpolation function, so that the element stiffness matrix calculation of the isoparametric element is carried out in the natural shape system under the natural coordinate system, and it is convenient to calculate the element stiffness matrix of different elements. Constructing the dual neural network, the element stiffness matrix act as the numerical results of the original function neural network to realize the high precision solution of the element stiffness matrix. The examples simulation shows that compared with the traditional Gaussian integral, the accuracy of the element stiffness matrix is improved by using the dual neural network integral method.

Keywords: Finite element method, Dual neural network, Multiple integral, Element stiffness matrix.

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