数学与系统科学研究院

计算数学所学术报告

(博士后定期学术报告)

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报告题目： **Finite Element Method of Optimal Control Problems of PDEs**

合作导师： 陈志明研究员

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Abstract：

Optimal control problem of partial differential equations is a very lively and active mathematical field and also has been widely studied and applied in the last 30 years. It needs a fast development of

numerical methods and the associated analysis must keep track to justify them and to prepare the basis for further research. The finite element approximation of optimal control problems has been extensively studied, however, when the control is constrained it seems not easy to prove that the a priori error estimates for states or costates are of optimal order. So in order to conquer that, super–close analysis is introduced as an important technique in finite element approximation of PDEs. As optimal control problems to be concerned, under the lower regularity of the constrained optimal control, we show that in fact one order can be gained via using a special projection. In this report, we investigate the superconvergence properties for a model optimal control problem of bilinear type, which includes some parameter estimation applications. Second, adaptive finite element methods based on a posteriori error estimates have become a central theme in scientific and engineer computations for their high efficiency, and moreover, efficiency and reliability of adaptive finite element

approximation rely very much on the error indicator used. Furthermore, in a constrained control problem, the optimal control and the state usually have different regularity, and what is more, the locations of the singularities are very different. Usually we know the optimal control has only limited regularity, this indicates that the current all−in−one mesh strategy may be inefficient. Adaptive multi−mesh; that is, separate adaptive meshes which are adjusted according to different error indicators, are often necessary. Particularly it seems to be important to use multi−set adaptive meshes in applying adaptive finite element method to computing optimal control. So, we study adaptive finite element discretisation schemes for our constrained optimal control problems using adaptive multi−mesh in developing efficient algorithms. We derive equivalent a posteriori error estimators, which particularly suit an adaptive multi−mesh finite element scheme. The error estimators are then implemented and tested with promising numerical results. 欢迎参加！