数学与系统科学研究院

计算数学所学术报告

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报告题目： **The basis partition of the space of linear programs (II)**

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计算数学所报告厅

Abstract： We consider the space of all linear programs with n nonnegative variables and m equality constraints. Each linear program (LP) is associated with a basis (a basis is a subset of indices {1,2,...,n}), in the sense that the limit of the central path of the LP, which is an optimal solution of the LP, corresponds to a unique basis. There are only a

finite number of bases. Thus, the space of linear programs (SLP) can be partitioned into a finite number of sets S1, S2, ..., Sk, each set containing all LPs which are associated with a common basis, (so called the basis partition). If this partition of the SLP can be explicitly characterized, then we can solve any set of (infinitely many) linear programs, e.g. a parametric LP, in the closed form. A novel tool for characterizing this partition of the SLP is presented as follows. Relating to the central path, there exists a universal ordinary differential equation M'=h(M) defined on projection matrices M. For any LP, one can define a projection matrix, starting from which the solution of M'=h (M) converges to a limit projection matrix which can determine the optimal basis of the LP. This establishes a corresponding partition on the space of projection matrices, denoted by G. G is the well-known Grassmann manifold. With the help of the vector field h(M) on the Grassmann manifold G, it is promising to discover full characterization of the partition of the SLP. We will present some properties related to the SLP found so far. Full structure of the basis partition of SLP is still awaiting an exploration.