A VECTOR-JUMP HEURISTIC FOR KARMARKAR'S LINEAR PROGRAMMING ALGORITHM

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1. Introduction. A significant amount of research has been done since 1984 in the area of interior-point algorithms for linear programming (LP). Some of these algorithms have rivaled the simplex method for LP. This paper presents a variant of Narendra Karmarkar's interior-point algorithm [1] for solving LP problems. The goal was to improve the efficiency of the algorithm by keeping track of the direction vectors in successive iterations and then heuristically exploiting this information to jump beyond the current iterate. A detailed description of this heuristic and experimental results are included.

2. Linear Programming. The general linear programming problem can be expressed by the following model.

Minimize

$$z = c_1x_1 + c_2x_2 + \cdots + c_nx_n$$

subject to the constraints

$$\begin{aligned} a_{11}x_1 + a_{12}x_2 + \cdots + a_{1n}x_n &\leq b_1 \\ a_{21}x_1 + a_{22}x_2 + \cdots + a_{2n}x_n &\leq b_2 \\ &\vdots \\ a_{m1}x_1 + a_{m2}x_2 + \cdots + a_{mn}x_n &\leq b_n \end{aligned}$$

and

$$x_1 \geq 0, \quad x_2 \geq 0, \quad \cdots, x_n \geq 0.$$

The variables $x_1, x_2, \cdots x_n$ are the decision variables while a_{ij}, b_i, and c_j are the parameters of the model. The function z is the objective function which is minimized or maximized depending on the problem.

In Karmarkar's algorithm, a restricted form of the above problem is required and is expressed in matrix notation.