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Title: An advanced initialization procedure for the simplex algorithm

Abstract: This paper addresses the computation of an initial basis for the simplex algorithm for linear programming. We propose six algorithms for constructing an initial basis that is sparse and will reduce the fill-in and computational effort during LU factorization and updates. The algorithms rely on triangulation and fill-reducing ordering techniques that are applied prior to LU factorization. Over a set of 62 large benchmarks, the best proposed algorithm produces remarkably sparse starting bases, and results in 7% and 6% average reduction of the execution time of CPLEX's primal and dual simplex algorithm, respectively. We also present results for very large and degenerate linear programming problems for which our best proposed algorithm leads CPLEX's primal and dual simplex algorithm to perform an order of magnitude faster than the CPLEX default crash procedures.