1049-90-28 **Gabor Pataki*** (gabor@unc.edu), Dept of Statistics and Operations Research, Hanes Hall, UNC Chapel Hill, Chapel Hill, NC 27599, and **Mustafa Tural** (tural@email.unc.edu), Dept of Statistics and Operations Research, Hanes Hall, UNC Chapel Hill, Chapel Hill, NC 27599. *Basis reduction, and the complexity of branch-and-bound.*

Branch-and-bound is a classical method to solve integer programming feasibility problems. On the theoretical side, it is considered inefficient: it can provably take an exponential number of nodes to prove the infeasibility of a simple integer program.

In this work we show that branch-and-bound is theoretically efficient, if we apply a simple transformation in advance to the constraint matrix of the problem which makes the columns short and near orthogonal. We analyze two such reformulation methods, called the rangespace- and the nullspace methods. We prove that if the coefficients of the problem are drawn from $\{1, ..., M\}$ for a sufficiently large M, then for almost all such instances the number of subproblems that need to be enumerated by branch-and-bound is at most one.

Besides giving an analysis of branch-and-bound, our main result generalizes a result of Furst and Kannan on the solvability of subset sum problems to bounded integer programs.

We give some numerical values of M which make sure that 99 percent of the reformulated problems solve at the rootnode. These values turned out to be surprisingly small for moderate values of n (the number of variables), and m (the number of constraints). (Received January 25, 2009)