1033-90-61 **Gabor Pataki*** (gabor@unc.edu), Dept of Statistics and Operations Research, 212 Smith Bldg, CB #3260, UNC Chapel Hill, Chapel Hill, NC 27516, and **Mustafa Tural** (tural@email.unc.edu), Dept of Statistics and Operations Research, UNC Chapel Hill, CB #3260, Chapel Hill, NC 27599-3260. *Fibonacci Numbers, Basis Reduction, and Integer Programming.*

Fibonacci Numbers (FNs) are an endlessly fascinating object of study. We study FNs in the context of lattice theory, and integer programming:

1. We characterize reduced bases – both in the LLL- and KZ-sense – of lattices consisting of vectors of the form $(F(n+i), e_i)$, where $F(n)$ is the nth Fibonacci number. Other FNs show up as a result of manipulating the original ones: if U is the unimodular transformation matrix associated with the basis reduction, then the last row of U^{-1} also consists of consecutive FNs.

2. We study *Fibonacci-knapsack problems,* in which the coeffiecients are consecutive FNs. We show that

   - they are infeasible, and branch-and-bound branching on the individual variables takes an exponential number of nodes to prove this;
   - branching on a suitable hyperplane with coefficients of different consecutive FNs proves the infeasibility at the rootnode!

3. Finally, we connect the first two areas. We prove that applying a suitable unimodular transformation to the Fibonacci knapsack results in an equivalent IP, in which the infeasibility (and thus the infeasibility of the original hard IP) is proven at the rootnode by branching on the last variable.

(Received August 30, 2007)