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Implementing the (not so) trivial lifting problem

When generating cuts for MIPs from multiple rows of the simplex tableau, one approach has been to relax the integrality of the non-basic variables, compute an intersection cut, then strengthen the cut coefficients corresponding to integral non-basic variables using the so-called trivial lifting procedure. Although of polynomial-time complexity in theory, this lifting procedure can be computationally costly in practice. For two-row relaxations, we present an algorithm that computes trivial lifting coefficients in constant time, for arbitrary lattice-free sets. This borrows ideas from solving integer programs in fixed dimensions and our results show that a bound on the number of iterations can be derived from the lattice width and covering radius of the lattice free set. Computational experiments confirm that the algorithm works well in practice.