In this paper we show how to circumvent some drawbacks and peculiarities of the LLL algorithm. To solve the approximate shortest vector in hard lattice problems, we have introduced some techniques such as: lattice diffusion and sublattice fusion, hill climbing, simulated annealing etc., each requiring a large number of parallel calls of the LLL algorithm, while attempting to solve the lattice basis reduction problem. The lattice diffusion and sublattice fusion algorithm is a technique based on the LLL algorithm. It relies on performing a large number of LLL reductions on permuted bases of a family of, not necessarily disjoint, sublattices and then fusing the reduced bases of the sublattices. In particular, we obtain best possible results for a number of competition instances in the problem.

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