
***** HORA INFORMATICAЕ *****

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Deterministic verification of integer matrix multiplication in quadratic time

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Let A , B and C be $n \times n$ matrices of integer numbers. We show that there is a deterministic algorithm of quadratic time complexity (w.r.t. the number of arithmetical operations) verifying whether $AB=C$. For the integer matrices this result improves upon the best known result by Freivalds from 1977 that only holds for a randomized (Monte Carlo) algorithm. As a consequence we design a quadratic time nondeterministic integer and rational matrix multiplication algorithm whose time complexity cannot be further improved. This indicates that any technique for proving a super-quadratic lower bound for deterministic matrix multiplication must exploit methods which would not work for the non-deterministic case.

* The work is based on the joint research of both authors which started shortly before the untimely death of Ivan Korec in 1998

