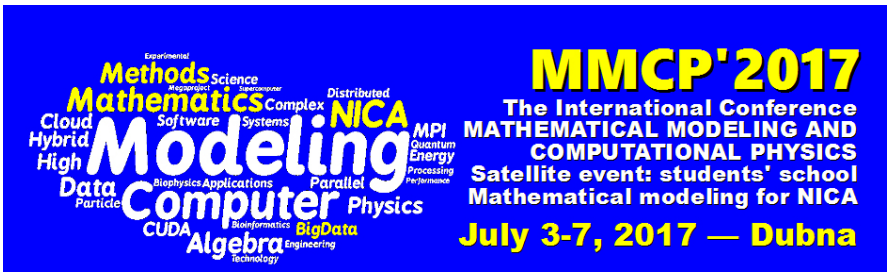

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ON THE LOAD BALANCING PROBLEM

We present new results on the Load Balancing Problem that concerns and assignment of given jobs to a set of machines each of which can process a subset of jobs. Each job requires one unit of processing time and must be assigned to some machine that can process it. The jobs have to be assigned in such a manner that minimises the total completion time. We exploit graph theory models and the divide-and-conquer nature of the semi-matching problem. We derive three algorithms for the optimal semi-matching problem. The first one runs in time O(√n ·m ·log n) on a graph with n vertices and m edges. The second one is randomized and computes an optimal semi-matching with high probability in time O(n^c ·log^(1+o(1)) n), where c is the exponent of the best known matrix multiplication algorithm. Since < 2.38, this algorithm breaks through O(n^2.5) barrier for dense graphs. In the case of planar graphs, the third one computes an optimal semi-matching in deterministic time O(n ·log^4 n). The character of designed algorithms allows parallelisation and distributed computing.

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