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Efficient Serial and Parallel Coordinate Descent Methods for Huge-Scale Truss Topology Design

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In this work we propose solving *huge-scale* instances of the truss topology design problem with coordinate descent methods. We develop four efficient codes: *serial* and *parallel* implementations of *randomized* and *greedy* rules for the selection of the variable (potential bar) to be updated in the next iteration. Both serial methods enjoy an $O(n/k)$ iteration complexity guarantee, where n is the number of potential bars and k the iteration counter. Our parallel implementations, written in CUDA and running on a graphical processing unit (GPU), are capable of speedups of up to two orders of magnitude when compared to their serial counterparts. Numerical experiments were performed on instances with up to 30 million potential bars.