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Systematic and Deterministic Graph-Minor Embedding of Cartesian Products of Complete Graphs ARMAN ZARIBAFIYAN, DOMINIC J.J. MARCHAND, SEYED SAEED CHANGIZ REZAEI, 1QBit — The limited connectivity of current and next-generation quantum annealers motivates the need for efficient graph-minor embedding methods. The overhead of the widely used heuristic techniques is quickly proving to be a significant bottleneck for real-world applications. To alleviate this obstacle, we propose a systematic deterministic embedding method that exploits the structures of both the input graph of the specific combinatorial optimization problem and the quantum annealer. We focus on the specific case of the Cartesian product of two complete graphs, a regular structure that occurs in many problems. We first divide the problem by embedding one of the factors of the Cartesian product in a repeatable unit. The resulting simplified problem consists of placing copies of this unit and connecting them together appropriately. Aside from the obvious speed and efficiency advantages of a systematic deterministic approach, the embeddings produced can be easily scaled for larger processors and show desirable properties with respect to the number of qubits used and the chain length distribution.

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