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Parity-Heap Transformations for Simulation of Fermionic Wavefunctions MICHAEL CURTIS, NICHOLAS RUBIN, EYOB SETE, WILLIAM ZENG, Rigetti Quantum Computing — An important application of quantum computing is the solution of electronic structure problems from quantum chemistry. These algorithms require a mapping of Fermionic operators into Pauli operators such as the Jordan-Wigner and Bravyi-Kitaev transformations, which introduce different gate-count overheads and runtimes. We introduce a general class of parity-heap transformations of which the Bravyi-Kitaev transform is a member. Different choices of heap result in new transformations. In particular, we study a new transform and associated encoding scheme which achieves better performance in realistic systems by generating the heap from the graph of actual qubit connectivity supported by quantum computing hardware.

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