Translating back and forth between braided and lattice surgery surface code circuits

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Lattice surgery and braided representations of surface code computations were considered being different. We show how to completely translate from one representation into the other. We use the ZX calculus to verify the identities. The translation method can be used in the automatic compilation and verification of surface code protected circuits. Another application is to benchmark, for a given circuit, which representation is more resource efficient with respect to physical qubit counts and execution time.