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Defining Canonical Momenta for Discretised $SU(2)$ Gauge Fields

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Simulating $SU(N)$ gauge theories on a quantum computer requires some form of digitization of the gauge degrees of freedom. Recently, we have proposed discretisation schemes, which offer in contrast to finite subgroups the possibility to freely refine the discretisation. Here we present an approach to define the corresponding canonical momentum operators. We present results on the restoration of the fundamental commutation relations towards continuous gauge field degrees of freedom.

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