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Gauge theory, lattices, and operator algebras

We present an operator-algebraic approach to gauge theory via projective systems of lattices. As an instructive example, we discuss Yang-Mills theory in two dimensions (YM_2) on a spacetime cylinder $\mathbb{R} \times S^1$. We explicitly construct the spatially-localized algebras of time-zero fields in the time gauge. Moreover, we obtain an associated 1-parameter family of gauge-invariant states arising via the Kogut-Susskind prescription for the Hamiltonian. By implementing gauge invariance in the field algebra, we recover the expected results for YM_2 . Our work complements existing results in the literature (notably by Witten, Sengupta et al., Dimock, Hall and King, Ashtekar et al., Balaban et al.). Furthermore, we relate our approach to a recent construction of unitary representations of Thompson's groups by Jones.

This talk is based on work done with Arnaud Brothier.