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Lattice Conformal Field Theory on the Riemann Sphere

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Viable non-perturbative methods for quantum field theories on curved manifold are difficult. By adapting features from both the traditional finite element methods (FEM) and simplicial Regge calculus we are developing a Quantum Finite Element Method (QFEM). To test the QFEM approach, we study the $\lambda\phi^4$ on the simplicial lattice for the Riemann Sphere. To reach the Wilson-Fisher fixed point in the continuum requires modifying the lattice Lagrangian by a counter terms which cancels the ultraviolet distortions of classical FEIM simplicial lattice. In addition Fermions are formulated on the Riemann sphere. Both are compared with the exact solutions to Ising $c = 1/2$ 2D CFT field theory. Future directions and application are entertained.

Primary author: Prof. BROWER, Richard (Boston University)

Co-authors: Dr FLEMING, George (Yale University); Dr CHENG, Michael (Boston University)

Presenter: Prof. BROWER, Richard (Boston University)

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