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Fisher's zeros as boundary of RG flows in complex coupling space

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We discuss the possibility of extending the RG flows to complex coupling spaces. We argue that the Fisher's zeros are located at the boundary of the complex basin of attraction of IR fixed points. We support this picture with numerical calculations at finite volume for 2D $O(N)$ models and the hierarchical Ising model using the two-lattice matching method. We present numerical evidence supporting the idea that, as the volume increases, the Fisher's zeros of 4D pure gauge $SU(2)$ lattice gauge theory with a Wilson action, stabilize at a distance larger than 0.1 from the real axis in the complex $\beta=4/g^2$ plane. We show that when a positive adjoint term is added, the zeros get closer to the real axis. We compare the situation with the $U(1)$ case. We discuss the implications of this new framework for proofs of confinement and searches for nontrivial IR fixed points in models beyond the standard model.

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talk

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