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An improvement of glueball mass calculations using gradient flow

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Removing ultraviolet noise from the gauge fields is necessary for glueball spectroscopy in lattice QCD. It is known that the Yang-Mills gradient flow method is an alternative approach instead of smearing or fuzzing of the links in various aspects. In this talk, we study the application of the gradient flow technique to the construction of the extended glueball operators. We find that a simple application of the original gradient flow method has some problems in glueball mass calculations at large flow time. To avoid this problem, only the spatial links are evolved by the “spatial gradient flow”, which is defined by the spatial gradient of the Wilson plaquette action. We examine the new gradient flow approach in calculations of glueball two-point functions and Wilson loops, and then discuss its efficiency in comparison with the original gradient flow method and traditional smearing methods.

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