

Gravitational Fixed Point for a Standard Model like Theory

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Quantum field theories on curved space have a diverging effective action that depends purely on the polynomials of the curvature tensor. One needs to add higher derivative terms in the bare gravitational action to renormalize these divergences. In this setting it becomes reasonable to calculate how the gravitational couplings run with the cut-off scale. It turns out that for a Standard Model like theory with 12 gauge bosons and 48 Weyl fermions all the gravitational beta functions precisely vanish! The caveat is that one also needs to include 36 Fradkin-Tseytlin like scalars that have a fourth derivative action. However, these scalars have logarithmic propagators that can be used to explain primordial perturbations in the early universe.

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