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Towards a LambdaCDM Universe in f(R) gravity

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ACDM model to date remains the best observationally fitting model for late time cosmology. However, this model suffers from the theoretical issue that the quantum vacuum energy, which is the only known candidate for Λ , gives from QFT calculation a value that mismatches with the observed value of Λ by orders of magnitude. This theoretical issue motivated the search for alternative late-time cosmological models. Among various alternative models, a broad class of models incorporate modified gravity, within which a significant subclass is f(R) gravity models. A very pertinent question to ask is whether there are some f(R) gravity models that can exactly mimic the Λ CDM evolution history. This question is of interest because if there are indeed such f(R) gravity models, then one need not worry about the theoretical issue on Λ . This problem can be approached with the reconstruction method of f(R) gravity, although the form is too complicated for further analytical consideration. We approach this problem with a new model-independent dynamical systems formulation of f(R) that we recently introduced in 2103.02274. We show that there is an inherent issue in trying to reproduce Λ CDM cosmology in f(R) gravity.

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