

Curvature-assisted dynamical compactification

Extra dimensions unavoidably appear in superstring theory, which is a plausible candidate for quantum gravity theory. Such extra dimensions should be small enough today to avoid observational inconsistency, which is achieved if the gravitational degrees of freedom (moduli) acquire effective potential to obtain vacuum expectation values that realize sufficiently small extra dimension volume.

Extrapolating from our observational facts that our universe has been expanding, one may think that the extra dimensions can also be smaller in the early universe and expand. However, such a scenario generally leads to the decompactification problem where the extra dimensional volume continue to expand.

We propose a scenario where our observed 3D space is initially open universe and extra dimension expands as our 3D spaces, while only extra dimensions stop to expand at some time. The key to realize such dynamics for moduli is the open universe curvature which gives strong Hubble friction force. Then, after moduli stabilization, subsequent inflation only expands 3D space and dilutes the open universe curvature, which makes the scenario observationally consistent.

We will also discuss possible consequences of our new scenario.

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