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Large-scale computation of the exponentially expanding universe in a simplified Lorentzian IIB matrix model

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The type IIB matrix model is conjectured to be a nonperturbative formulation of superstring theory.In 2011, the Lorentzian version of the model was studied for the first time by Monte Carlo simulation, and it was shown that (3+1)D expanding universe emerges from (9+1)D space-time predicted by superstring theory. Recently, a simplified model that describes the early time behaviors of the original model was studied with matrix size up to N=64, and it was suggested that the expansion of the (3+1)D universe is actually exponential, which is reminiscent of the inflation.

In this work, we confirm this exponential expansion by simulating the simplified model with much larger matrix size up to N=512 using a large-scale parallel computer.

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