Is it real? Physicists propose method to determine if the universe is a simulation

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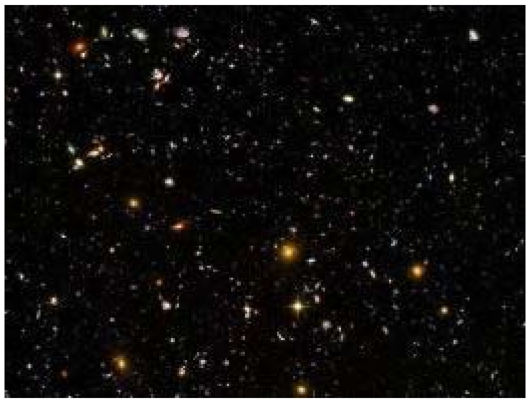

The team's idea is based on work being done by other scientists who are actively engaged in trying to create simulations of our universe, at least as we understand it. Thus far, such work has shown that to create a simulation of reality, there has to be a three dimensional framework to represent real world objects and processes. With computerized simulations, it's necessary to create a lattice to account for the distances between virtual objects and to simulate the progression of time. The German team suggests such a lattice could be created based onquantum chromodynamics—theories that describe the nuclear forces that bind subatomic particles.

To find evidence that we exist in a simulated world would mean discovering the existence of an underlying lattice construct by finding its end points or edges. In a simulated universe a lattice would, by its nature, impose a limit on the amount of energy that could be represented byenergy particles. This means that if our universe is indeed simulated, there ought to be a means of finding that limit. In the observable universe there is a way to measure the energy ofquantum particles and to calculate their cutoff point as energy is dispersed due to interactions with microwaves and it could be calculated using current technology. Calculating the cutoff, the researchers suggest, could give credence to the idea that the universe is actually a simulation. Of course, any conclusions resulting from such work would be limited by the possibility that everything we think we understand about quantum chromodynamics, or simulations for that matter, could be flawed.

More information: Constraints on the Universe as a Numerical Simulation, arXiv:1210.1847 [hep-ph] arxiv.org/abs/1210.1847

Abstract

Observable consequences of the hypothesis that the observed universe is a numerical simulation performed on a cubic space-time lattice or grid are explored. The simulation scenario is first motivated by extrapolating current trends in computational resource requirements for lattice QCD into the future. Using the historical development of lattice gauge theory technology as a guide, we assume that our universe is an early numerical simulation with unimproved Wilson fermion discretization and investigate potentially-observable consequences. Among the observables that are considered are the muon g-2 and the current differences between determinations of alpha, but the most stringent bound on the inverse lattice spacing of the universe, b^(-1) >~ 10^(11) GeV, is derived from the high-energy cut off of the cosmic ray spectrum. The numerical simulation scenario could reveal itself in the distributions of the highest energy cosmic rays exhibiting a degree of rotational symmetry breaking that reflects the structure of the underlying lattice.