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Massline and other recent results of CDT quantumgravity

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Causal Dynamical Triangulations is a nonperturbative approach to quantum gravity based on Regge calculus, which uses lattice regularization in the form of a triangulation. To describe the theory for dimension higher than 2 only numerical simulations are available. It is well known through the numerical simulations, that for certain values of bare coupling constants the de-Sitter Universe emerges as a dynamically created background solution around which quantum fluctuations are observed, which agrees with the solutions of the Minisuperspace model. The effects of including scalar-/vector- fields or particles in the theory is less understood. In our new research we are analyzing the effect of introducing closed timelike loops for point particles of various masses and lattice volumes, for spherical and toroidal topologies. The massline is minimally coupled to the geometry through the action dependent on its mass and length $S_m = m * L$. The next step will be to measure the possible behavior of two or more such masslines to see their interaction may produce any noticable gravitational effect. These massline measurements and some other new approaches help us understanding the underlying structure of the generated triangulations.

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