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Closed spherically symmetric massless scalar field spacetimes have finite lifetimes. (English) 


Summary: The closed-universe recollapse conjecture is studied for a class of closed spherically symmetric spacetimes which includes those having as a matter source (1) a massless scalar field, (2) a perfect fluid obeying the equation of state $\rho = P$, and (3) null dust. It is proven that all timelike curves in any such spacetime must have a length less than $6 \max \Sigma (2m)$, where $m$ is the mass associated with the spheres of symmetry and $\Sigma$ is any Cauchy surface for the spacetime. The simplicity of this result leads us to conjecture that a similar bound can be established for the more general spherically symmetric spacetimes.

MSC:

83C20 Classes of solutions; algebraically special solutions, metrics with symmetries for problems in general relativity and gravitational theory

83F05 Relativistic cosmology

Keywords:
closed-universe recollapse conjecture; spherically symmetric spacetimes; timelike curves

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References:


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