Constant mean curvature spacelike hypersurfaces in spacetimes admitting a parallel lightlike vector field

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Abstract

In this work, I study constant mean curvature spacelike hypersurfaces in spacetimes that have an infinitesimal symmetry given by a parallel lightlike vector field. In fact, these spacetimes can model radiation propagating at the speed of light.

I mainly focus here on global properties of constant mean curvature spacelike hypersurfaces. So, I give a nonexistence result for nonzero constant mean curvature compact hypersurfaces as well as prove that every compact maximal hypersurface in a spacetime obeying the timelike convergence condition is totally geodesic.

Furthermore, I also obtain a uniqueness theorem for complete (nonclosed) maximal surfaces in three dimensional spacetimes that also satisfy the previous energy condition. This is a proper generalization of the classical Calabi-Bernstein parametric theorem.

References

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