

Lorentzian warped products with one dimensional base and length space fibers

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Smooth Lorentzian warped products of the form $I \times_f (M, g)$, where (M, g) is a Riemannian manifold and f is a positive smooth function on an interval I , are important examples of spacetimes: They contain well-known physical models (such as the FLRW spacetimes) and admit a very simple description of causal curves and geodesics.

We will examine what happens if one replaces the Riemannian manifold (M, g) with a locally compact length space (X, d) . As long as f is continuous and positive there still exists a natural notion of causal curves and their length and hence also of the causality relations on the product $I \times_f X$. This turns $I \times_f X$ into a Lorentzian length space (as defined in [1]). Analogous to the smooth case the causal structure of such warped products is very simple and one has an explicit description of $\partial J^+(p)$. Inspired by the well-developed Riemannian theory of warped products of length spaces, we also obtain some results concerning timelike curvature bounds for Lorentzian warped products of this type.

References

- [1] M. Kunzinger and C. Sämann, Lorentzian length spaces, *Ann. Glob. Anal. Geom.* **54** (2018), pp. 399–447.