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COMMENTS ABOUT DISTANCES

In this work we consider spaces, endowed with a Lorentzian metric. In these spaces the distance between the objects (points) can be positive, negative or zero – this is a peculiarity of metric. Furthermore, by definition of the metric, the distance between the objects (points) can be infinite (see [1; 2]). But the topology of the space, in general, can have a quite random structure. The object of our intense interest in this work is the study of the causes of appearance infinity Lorentzian distance in these spaces.

Interestingly, in the present applications Lorentzian geometry we have idea of identifying the Lorentzian distance with its own time, which is home to an object moving in a certain space-time path from one point to another. In this way the subject matter of the causes of the infinite distance between the points gets another facet that supports our continued interest in the subject.

Further, in a succinct form some groups described causes that may lead to Lorentzian infinite distances in space with the appropriate metric. Note that these reasons apply to both the behavior of the metric and the topological structure of space-time.

The first group is characterized by the presence of the causes of closed time-like curves in space. Lorentzian distance between any two points lying on a the curve is infinite: $d(a, b) = sup\ L(\gamma_{ab}) = \infty$. Such spaces are not chronological.

The second group of reasons is related to the phenomenon of "continuous" closed sets of isotropic curves. Continuity understood here in the sense of the C^0- topology of the curves (see [1]). The cause of the endless distances of Lorentz is the behavior of the metric in the area, isotropic consisting of closed curves.

Another group of factors takes place in spaces which contain isotropic closed curves isolated from their kind. The cause of the infinite distance between Lorentz some points is the "extreme" behaviors in the metric the immediate vicinity of the closed curve isotropic.

The next situation that might lead to an infinite distance will appear in the spaces, which do not contain closed causal curves but may contain entrained (past or future) causal curves ie capture the phenomenon is permissible. Such spaces are causative, but are neither stable reason, no strong reason, that is, small changes in the metric can lead to a closed causal curves. Just because of these “unstable causal” regions we get infinite values of the Lorentzian distance.

Another type is characterized by joint space conditions, down to the topological and causal structure of space: in the presence of some of the space-time “cut” (closed) areas. Behavior metrics may be such that a sufficient “proximity” to such area metric coefficients would take an infinite value.

This phenomenon can lead to an infinite Lorentzian distance between some points of space-time. Note that this situation with the behavior of the metric can be simulated artificially – by introducing features – smooth conformal factor for the metric with the required properties. But this is just it is possible only in the space with the corresponding topological structure.

References

1. *Beem J.K., Erlich P.E., Easley K.L.* Global Lorentzian geometry. N.Y.: Marcel Dekker Inc., 1996.

2. *Romanov A.N.* Imaging space-time and causality condition // Abstracts Conference on analysis and geometry. Novosibirsk: IM SB RAS, 2004. P. 219.