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Conformal manifolds, tractors, and the asymptotic geometry on gravitational waves

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Abstact

Our current model for describing the asymptotic behaviour of gravitational waves is based on a class of Lorentzian manifold called "asymptotically flat space-times". These manifolds are particular cases of conformally compact manifold and accordingly it has been acknowledge for a long time that conformal geometry plays a crucial role in this context. However, for most purpose practitioners in this field need to work with a fixed representative of the conformal class of metric and most of the conceptual advantages of this point of view is lost. In the last decade, on the other hand, there has been a lot of progress in the understanding of the geometry of conformally compact manifolds, in particular in manifestly conformally invariant ways through the use of tractor calculus. I will explain how this can be used to neatly describe the asymptotic geometry of gravitational waves. To do so I will first review elements of conformal geometry, conformal compactification and tractors before applying them to the physical space-times.