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Bjorling problem for timelike surfaces and solutions of homogeneous wave equation

In this talk we show how to construct split-holomorphic extensions of initial curves $\gamma(t)$ in the Lorentz space $\mathbb{R}^3_1$, using, in a natural way, the point of view of solutions of homogeneous wave equation. After extending that curve to a subset of split-complex plane, we solve explicitly the Bjorling problem for timelike surfaces in the Lorentzian spaces $\mathbb{R}^3_1$, $\mathbb{R}^4_1$ and $\mathbb{R}^4_2$. As consequences we construct new examples and give applications. In particular, we describe one-parameter families of timelike surfaces which are solutions of the timelike Bjorling problem. In addition, we also establish symmetry principles for the class of minimal timelike surfaces in those ambient spaces. These results are part from the published papers by the author in Journal of Mathematical Analysis and Applications, Journal of Geometry and Physics and Annali di Matematica Pura ed Applicata.

We remember that the classical Bjorling problem was proposed by Bjorling in 1844 and consists of the construction of a minimal surface in $\mathbb{R}^3$ containing the strip in the interior. The solution was obtained by Schwarz in 1890 through of a explicit formula in terms of initial datas. After that, the Bjorling problem has been considered in other ambient spaces, including in bigger codimmension or with indefinite metrics.