Double rotational surfaces in Euclidean and Lorentz-Minkowski 4-space

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One of the most basic examples of surfaces in 3-dimensional Euclidean space is a rotational surface or a surface of revolution, that is, a surface which is the trace of a planar curve that is rotated about an axis in its supporting plane. Its simple construction makes that it is appealing to geometers, but also is open to alteration. One possible generalization is to subject a planar curve to two simultaneous rotations. The resulting surface is called a twisted surface and studied in e.g. [2] (see also the references therein). Another possibility is to extend the concept of a rotational surface to higher dimensional ambient spaces, see e.g. [3, 4]. Combining these two points of view leads to the construction of a double rotational surface in 4-space: perform on a planar curve in 4-space two simultaneous rotations, possibly at different rotation speeds.
In this contribution I want to present double rotational surfaces in 4-space and advertise them as possible research subjects, possible (counter-) examples and inspirational objects for further research. Also I want to comment on a partial result about these surfaces, namely, on flat double rotational surfaces and their relation with Clelia curves, see [1]. The ambient 4-space will be Euclidean or Lorentz-Minkowski 4-space.

References

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[3] C. L. E. Moore, *Surfaces of rotation in a space of four dimensions*, Annals of Mathematics, Second Series 21(2), 1919, 81-93.
[4] G. Vranceanu, *Surfaces de rotation dans E_4*, Revue Roumaine de Mathématiques Pures et Appliquées 22(6), 1977, 857-862.