

Double rotational surfaces in Euclidean 4-space

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A logical continuation of our previous study of twisted surfaces (see [2] and the references therein), is to generalize this concept to a higher dimensional space. Hence, in this talk, I want to present some first results on double rotational surfaces in 4-dimensional Euclidean space.

Since there are two possible rotations in Euclidean 4-space, namely rotations about a plane and rotations about a point, one has to consider all possible combinations of the two simultaneous rotations that are used to construct a double rotational surface. When starting with a planar curve as profile curve, this leads to only one possible parametrization of a double rotational surface, up to a transformation. In the other cases, either a twisted surface in Euclidean 3-space or, (a part of) a plane is obtained. The double rotational surface of course incorporates the ordinary rotational surface in Euclidean 4-space as a special case.

For these double rotational surfaces some curvature properties are examined. That is, flat double rotational surfaces and minimal double rotational surfaces are studied. Imposing these curvature conditions on a double rotational surface, leads to large expressions which can be studied systematically using for instance Maple. As to be expected, the results incorporate several new surfaces among which cones defined over a 4-dimensional version of Clelia curves (for an overview of properties of Clelia curves in 3-space, see [1] and the references therein).

In the light of these results it is of course promising to transfer this study to Minkowski 4-space as further research. One expects to find, due to the different causal character of vectors existing in that space, even more interesting new surfaces.

- [1] Goemans W, Van de Woestyne I. Clelia Curves, Twisted Surfaces and Plücker's Conoid in Euclidean and Minkowski 3-space. Contemporary Mathematics 674. Recent Advances in Submanifold Geometry, A Proceedings Volume Dedicated to the Memory of Franki Dillen (1963-2013). Editors A. Carriazo, Y.M. Oh, J. Van der Veken and B. Suceavă, to appear.

- [2] Goemans W, Van de Woestyne I. Twisted Surfaces with Null Rotation Axis in Minkowski 3-Space. Results in Mathematics. DOI 10.1007/s00025-015-0462-2, to appear.
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