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Spacelike Helicoidal Surfaces with Constant Mean Curvature in Minkowski 3-space

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1. Introduction.

Surfaces with constant mean curvature in Minkowski 3-space L^3 have been studied in a lot of fields. For example, there are researches in relational to harmonic mappings between hyperbolic 2-spaces (cf. [1], [2], [5]) and affine differential geometry (cf. [7]).

In this paper we study surfaces of revolution and spacelike helicoidal surfaces in L^3.

A surface in L^3 is called a spacelike surface if the induced metric on the surface is a positive definite Riemannian metric. Moreover, a timelike surface in L^3 is a surface which inherits a non-degenerate indefinite metric from the standard metric in L^3.

It is well-known that C. Delaunay [6] solved the differential equation of surfaces of revolution under constancy of the mean curvature and gave a method of geometric constructions for such surfaces. For the proof, he first obtained a parametrization of an evolute of the generating curve. By making use of this parametrization, he found a representation formula for the generating curve. Therefore these solutions hold only on some intervals on which the evolute can be defined. More generally, K. Kenmotsu [11] gave a representation formula for surfaces of revolution with prescribed mean curvature in Euclidean 3-space.

Spacelike maximal surfaces of revolution in L^3 were studied by O. Kobayashi [12] and L. McNertney [15]. On the other hand, timelike minimal surfaces of revolution in L^3 were classified by L. McNertney (cf. [20]). Furthermore McNertney gave one parameter deformations for various catenoids and helicoids. Moreover, the timelike minimal surfaces have been a subject of several wide interests [14], [16], [17], [18] and [21].

J. Hano and K. Nomizu [9] classified the spacelike surfaces of revolution in L^3 that have constant mean curvature and proved that the profile curve of a surface of revolution with nonzero constant mean curvature in L^3 can be described as the locus of focus when a quadratic curve is rolled along the axis of revolution. However, they did not give a representation formula for spacelike surfaces in L^3.

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