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ON THE MEAN, GAUSS, THE SECOND GAUSSIAN AND THE SECOND MEAN CURVATURE OF THE HELICOIDAL SURFACES WITH LIGHT-LIKE AXIS IN $\mathbf{R}_1^3$

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Abstract. In this paper, the second Gaussian and the second mean curvature of the helicoidal surfaces with light-like axis of type IV^+ is obtained in Minkowski 3-space. In addition, some relations between the mean, Gauss, the second Gaussian and the second mean curvature of the helicoidal surfaces with light-like axis of type IV^+ are given in Minkowski 3-space.

Introduction

Helicoidal surfaces are naturel generalization of rotation surfaces, of which many nice works have been done such as [1, 2, 3, 5, 7, 10, 11].

About helicoidal surfaces in Euclidean 3-space, M. P. do Carmo and M. Dajczer [5] proved that, by using a result of E. Bour [4], there exists a two-parameter family of helicoidal surfaces isometric to a given helicoidal surface. By making use of this parametrization, they found a representation formula for helicoidal surfaces with constant mean curvature.

In 2000, T. Ikawa [10] showed that a generalized helicoid and a rotation surface have an isometric relation by Bour's theorem in Euclidean 3-space. He determined pairs of surfaces with the additional condition that they have the same Gauss map using Bour's theorem. Ikawa [11] classified the spacelike and timelike surfaces as (axis, profile curve)-type in Minkowski 3-space in 2001. He proved an isometric relation between a spacelike (timelike) generalized helicoid and a spacelike (timelike) rotation surface with spacelike (timelike) axis by Bour's theorem. Beneki, Kaimakamis and Papantoniou [2] classified four kinds of helicoidal surface with spacelike, timelike and lightlike axes in 2002. In 2004,

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