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TIMELIKE ROTATIONAL SURFACES WITH LIGHTLIKE PROFILE CURVE

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Abstract. In this work, some geometric properties of the timelike rotational surfaces with lightlike profile curve of (S, L), (T, L) and $(L, L) - types$ are shown in Minkowski 3−space.

1. Introduction

Rotational surfaces in Euclidean 3−space have been studied for a long time and many examples of such surfaces have been discovered. On the other hand, Minkowski 3−space has more complicated geometric structures compared to Euclidean 3−space. In particular, Minkowski 3−space has distinguished axes of rotation, namely, *spacelike*, *timelike* and *lightlike* (or *null*) *axes*. About the semi (proper) Riemannian geometry, many nice books have been done such as [4], [5] and [9].

If we focus on the ruled (helicoid) and rotational characters, we have Bour's theorem in [2].

Ikawa determined pairs of surfaces by Bour's theorem with the additional condition that they have the same Gauss map in Euclidean 3−space in [6]. Ikawa classified the spacelike and timelike surfaces as *(axis, profile curve)−type* in [7]. He proved an isometric relation between a spacelike (timelike) generalized helicoid and a spacelike (timelike) *rotational surface* of spacelike (timelike) axis of $(S, S), (S, T), (T, S)$ and $(T, T) - types$ by Bour's theorem in Minkowski 3−space.

Güler [3] showed that a generalized helicoid and a rotational surface with *lightlike profile curve* have an isometric relation by Bour's theorem in Minkowski 3−space. He classified the spacelike (and timelike) helicoidal (and rotational) surfaces with lightlike profile curve of (S, L), (T, L) and $(L, L) - types$.

Consider a smooth surface $\mathbf{M}$ in $\mathbb{R}^3_1$ is described locally by an isometric immersion

$$R : \mathbf{D} \subset \mathbb{R}^2 \longrightarrow \mathbb{R}^3_1$$

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