

Asymptotic directions of spacelike submanifolds and associated Surfaces with non isolated singularities

Ana Claudia Nabarro¹

¹ ICMC-USP

Spacelike submanifolds in de Sitter space have been investigated from the viewpoint of singularity theory. We followed this approach to study properties of the second order geometry in the case of spacelike surfaces in de Sitter space S_1^5 . Our first aim was to study the geometry of the second fundamental form with respect to lightlike normal directions of the surface. We studied the orbits of the action of the group $GL(2, \mathbb{R}) \times SO(1, 2)$ on the system of conics defined by the second fundamental form. We introduced an ellipse in affine space called LMN-ellipse, that gives information on the lightlike binormal directions and their associated asymptotic directions. The main results in our first paper are the classification of the second fundamental mapping and the description of the possible configurations of the LMN -ellipse. We continue the investigation of the geometry of spacelike surfaces, focusing on the generic properties of the equations of asymptotic directions (AD-equations) and lightlike binormal directions (BD-equations) of the surface. These equations are highly degenerated as they reflect the geometry of a section of Minkowski space. We prove that the lifting of the AD equation to the unitary cotangent bundle of the surface is a 2 dimensional surface with non isolated singularities, which are generically transverse double points and Whitney umbrellas. It was a surprise to appear non isolated singularities and we don't know other binary equations of the differential geometry with this property. More investigations are been done for lightlike binormal directions to explain some dualities.

Joint work with Masaki Kasedo and Maria Aparecida Soares Ruas.