SPACELIKE SURFACES OF CONSTANT GAUSSIAN CURVATURE IN $(2+1)$-MINKOWSKI SPACE

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We will discuss the problem of existence and uniqueness of spacelike surfaces of negative constant (or prescribed) Gaussian curvature K in $(2+1)$-dimensional Minkowski space. The simplest example, for $K=-1$, is the well-known embedding of hyperbolic plane as the one-sheeted hyperboloid; however, as a striking difference with the sphere in Euclidean space, in Minkowski space there are many non-equivalent isometric embeddings of the hyperbolic plane.

This problem is related to solutions of the Monge-Ampère equation

$$\det D^2 u(z) = \frac{1}{|K|}(1-|z|^2)^{-2}$$

on the unit disc. We will prove the existence of surfaces with the condition $u = f$ on the boundary of the disc, for f a bounded lower semicontinuous function. If the curvature $K = K(z)$ depends smoothly on the point z, this gives a solution to the so-called Minkowski problem.

On the other hand, we will prove that, for K constant, the principal curvatures of a K-surface are bounded if and only if the corresponding function f is in the Zygmund class.

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