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On Backlund and Ribaucour transformations for surfaces and the sine-Gordon equation

Keti Tenenblat

Universidade de Brasília

Abstract

Given a surface in the Euclidean 3-space with constant negative Gaussian curvature, the composition of Bäcklund transformations generates a 4-parameter family of surfaces with the same curvature. Since Ribaucour transformations of such a surface also provides a 4-parameter family of surfaces of the same type, one has the following natural question. Are these two methods equivalent? The answer is negative in general. Necessary and sufficient conditions for the surfaces given by the two procedures to be congruent are obtained. An explicit example is given of a composition of Bäcklund transformations which is not a Ribaucour transformation. The analytic interpretation of this result provides a method of producing solutions of the sine-Gordon equation, distinct from those obtained by Bäcklund transformations. New exact solutions are given and some of the corresponding surfaces are visualized. This is a joint work with Claudiano Goulart, published in Geometria Dedicata (2016).

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