Special Cases of Weingarten Translation Surfaces in Euclidean and Minkowski 3-space

Wendy Goemans

Some results on Weingarten translation surfaces and more specific translation surfaces with vanishing second Gaussian curvature, in $\mathbb{E}^3$ and $\mathbb{E}^3_1$, are presented.

For surfaces with non-degenerate second fundamental form the second Gaussian and second mean curvature are, respectively, defined as the Gaussian and mean curvature of the second fundamental form. They are denoted with K_{II} and H_{II} respectively. We define a surface to be a Weingarten surface if it is an (A, B)-W-surface for $A \neq B \in \{K, H, K_{II}, H_{II}\}$. An (A, B)-W-surface is a surface on which there exists a non-trivial functional relation $\Phi(A, B) = 0$ between two curvatures A and B of the surface.

Special examples of Weingarten translation surfaces are investigated, namely those surfaces for which K_{II} is zero. Since minimal surfaces have second Gaussian curvature zero, the minimal translation surfaces of Scherk are among these examples. Other non-trivial examples of surfaces that satisfy the curvature condition examined, can be expressed in terms of the less known LambertW function. Most attention will be paid to this last kind of special cases.