Centroaffine Surfaces with parallel traceless Cubic Form

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Abstract

In this paper, we classify the centroaffine surfaces with parallel cubic Simon form and the centroaffine minimal surfaces with complete positive definite flat metric.

1 Introduction.

Let $x : \mathbf{M} \to \mathbb{R}^3$ be a nondegenerate centroaffine surface. Then x induces a centroaffinely invariant metric g and a so-called induced connection ∇ . The difference of the Levi-Civita connection $\widehat{\nabla}$ of g and the induced connection ∇ is a (1,2)-tensor C on \mathbf{M} with the property that its associated cubic form \widehat{C} , defined by

(1.1)
$$\widehat{C}(u,v,w) = g(C(u,v),w)), \ u,v,w \in TM,$$

is totally symmetric. The so-called Tchebychev form is defined by

(1.2)
$$\widehat{T} = \frac{1}{2} \operatorname{trace}_{g}(\widehat{C}).$$

Using \hat{C} and \hat{T} one can define a traceless symmetric cubic form \tilde{C} by

(1.3)
$$\widetilde{C}(u,v,w) = \widehat{C}(u,v,w) - \frac{1}{2}(\widehat{T}(u)g(v,w) + \widehat{T}(v)g(u,w) + \widehat{T}(w)g(u,v)),$$

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