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On the intrinsic geometry of a unit vector field

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Abstract: We study the geometrical properties of a unit vector field on a Riemannian 2-manifold, considering the field as a local imbedding of the manifold into its tangent sphere bundle with the Sasaki metric. For the case of constant curvature K, we give a description of the totally geodesic unit vector fields for $K = 0$ and $K = 1$ and prove a non-existence result for $K \neq 0, 1$. We also found a family ξ_ω of vector fields on the hyperbolic 2-plane L^2 of curvature $-c^2$ which generate foliations on T_1L^2 with leaves of constant intrinsic curvature $-c^2$ and of constant extrinsic curvature $-\frac{c^2}{4}$.

Keywords: Sasaki metric, vector field, sectional curvature, totally geodesic submanifolds
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