Circular mappings with minimal critical set

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The circular φ-category of a manifold M is introduced in the paper [1]. It is defined as the φ-category of the pair (M, S^1) corresponding to the family $C^\infty(M, S^1)$, where S^1 is the unity circle. That is

$$\varphi_{S^1}(M) = \min\{\mu(f) : f \in \mathcal{C}^\infty(M, S^1)\},$$

where $\mu(f)$ denotes the cardinality of the critical set of mapping $f : M \to S^1$. Taking into account the inequality $\varphi_{S^1}(M) \leq \varphi(M)$, where $\varphi(M)$ denotes the real φ-category of M, one of the main goals of this paper is to provide classes of manifolds M satisfying the equality $\varphi_{S^1}(M) = \varphi(M)$. The circular version of the Ganea conjecture is also discussed.

References

[1] D.Andrica, D.Mangra, C.Pintea, *Aspects of Global Analysis of Circle-Valued Mappings*, in "Topics in Mathematical Analysis and Applications", L.Tóth and Th.M.Rassias, Eds., Springer, 2014.