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On lengths of closed geodesics

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Alors l'opérateur L est un isomorphisme topologique de U sur $L_{2,\omega}(Q)$.

B i b l i o g r a p h i e

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[2] O. VEJVODA ET AL.: Partial differential equations: time-periodic solutions, Sijthoff-Nordhoff, Alphen aan den Rijn (à paraître).

ON LENGTHS OF CLOSED GEODETICS

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Theorem: Let M be a compact real-analytic Riemannian manifold. Denote by $\mathcal{L}$ the set of lengths of all closed geodetics on M. Then $\mathcal{L}$ is the discrete subset of $[0,+\infty)$, i.e. the set $\mathcal{L} \cap [0,c)$ is finite for all $c>0$.

Remark. The real-analytic Riemannian manifold is defined as a differentiable manifold, which can be covered by charts such that all transition functions are real-analytic and the metric, expressed in any chart of this cover, is real-analytic, too.

Outline of the proof. The energy functional E can be shown to be analytic in a neighborhood of a geodetic c in the space $H^1(S,M)$ of all curves (see [1]). It suffices to use the methods of [2, Chap. IV, App. VI] in local coordinates. If we use so called infinite-dimensional Morse-Sard theorem [2, Chap. IV], we can show that in a neighborhood of the geodetic c there is only one critical level of the functional E. The Fredholm condition, needed in the proof of this fact, follows from [1, 2.4.2]. Then it is sufficient to use the Palais-Smale condition [1, 1.4.7] and the relation between the length and energy of geodetics.

Detailed proof will be published elsewhere.

R e f e r e n c e s

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[2] S. FUČÍK, J. NEČAS, J. SOUČEK, V. SOUČEK: Spectral Analysis of Nonlinear Operators, Lecture Notes in Math. 346, Springer-Verlag 1973.

NON-REMOVABLE IDEALS IN COMMUTATIVE BANACH ALGEBRAS

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An ideal I in a commutative Banach algebra A is called removable if there exists a superalgebra $B \supset A$ such that I is not contained in a proper ideal in B. We say that an ideal $I \subset A$ consists of joint topological divisors of zero if $\inf_{\substack{x \in A \\ |x|=1}} \sum_{i=1}^{n} |a_i x| = 0$ for every finite family $a_1, \dots, a_n \in I$. Obviously I is non-removable in this case.

These notions were introduced and studied by R. Arens, W. Żelazko and others. Arens and Żelazko conjectured that the converse statement is also true i.e. that an ideal I in a commutative Banach algebra is non-removable if and only if it consists of joint topological divisors of zero.

A positive answer to this conjecture is going to appear in Studia Math. As easy consequences this yields that every finite family of removable ideals can be removed simultaneously and it also gives positive answers to several other questions of Arens and Żelazko.