



Leibniz
Universität
Hannover

Oberseminar Analysis und Theoretische Physik

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The sub-Riemannian geometry of screw motions with constant pitch

Let M be an oriented three-dimensional Riemannian manifold of constant sectional curvature $k = 0, 1, -1$ and let $SO(M)$ be its direct orthonormal frame bundle (direct refers to positive orientation), which has dimension six and may be thought of as the set of all positions of a small body in M . Given $\lambda \in \mathbb{R}$, there is a three-dimensional distribution D^λ on $SO(M)$ accounting for infinitesimal rototranslations of constant pitch λ . We show that the associated system is controllable when $\lambda \neq k^2$. In this case, we describe the geodesics of the canonical sub-Riemannian structure. For $k = 0, -1$, we compute the lengths of all periodic geodesics of $(SO(M), D^\lambda)$ in terms of the lengths and the holonomies of the periodic geodesics of M .

It turns out that the notion of rototranslating with constant pitch makes sense for some higher dimensional Riemannian manifolds, for instance, for \mathbb{R}^7 via the octonionic cross product, or for orthogonal and unitary matrix groups. We define sub-Riemannian structures analogous to the above and find some of their geodesics.

**Dienstag, 11.6.2024, 15:00 Uhr, Raum c311
Hauptgebäude der Leibniz Universität**

Dazu laden herzlich ein:

Prof. Dr. Wolfram Bauer, Prof. Dr. Joachim Escher, Prof. Dr. Johannes Lankeit,
Prof. Dr. Elmar Schrohe, Prof. Dr. Alexander Strohmaier,
Prof. Dr. Christoph Walker, Dr. Alden Waters