SUMMARY OF RESEARCH PROPOSAL

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The current project is mainly dedicated to the studying of some natural generalizations of interval exchange transformations (IET)- systems of isometries and interval translation mappings (ITM). IET play a crucial role in the theory of foliations on surfaces where they appear as the first return maps on the transversal, and also in symbolic dynamics and geometry of Teichmüller spaces.

The motivation to consider some generalizations of this notion came from low-dimensional topology (Novikov's problem of asymptotic behavior of plane sections of triply periodic surface) and geometric group theory (in particular, theory of $\mathbb{R}$-trees and automorphisms of free groups). Also, interval translation mappings can be studied in a pure dynamical context as the first return maps on a particular section of a billiard with one-sided scattering.

From **dynamical** and **topological** point of view, the main goals are to prove the conjecture posed by S. P. Novikov and A. Maltsev in 2003 about the Hausdorff dimension of the set of chaotic regimes and to understand the behavior of the trajectory in chaotic case. For both of these purposes, systems of isometries of order 3 are studied. We plan to concenrate on their properties to be minimal, ergodic, uniquely ergodic and we expect some non-trivial results in this direction since the dynamics of IET and the dynamics of systems of isometries were shown to be completely different.

We also study possible applications of more subtle dynamical results (like exponential decay of correlation, existence of invariant measures and properties of Lyapunov spectra) to the topological problem. Some partial results that were obtained in collaboration with P. Hubert and A. Avila are expected to be extended (we plan to establish some analogs of other theorems known for IET at least for the very special class of systems of isometries that we already studied) and we plan to generalize these results for a larger group of systems of isometries.

From the point of view of theory of $\mathbb{R}$-**trees** our research is a source of interesting examples of non-typical behavior of band complexes of thin type.

On the other hand, there exists a very strong connection between IET and **algebraic geomery**: Teichmüller flow is basically a geodesic flow in a moduli space. Another goal of the current project is to find a kind of analogue of this construction for systems of isometries.

In a context of **symbolic dynamics** for ITM and special class of billiards, the main point is to answer the questions about combinatorial and total complexity. Also, we are interested in the option to extend for the biliards with spy mirrors some properties known for ordinary billiards. Our closest goal is to study the entropy of this class of dynamical systems. The most challengeable part consists in a non-invertibility of our system.