DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

The mathematical theory of dynamical systems was originated in the works of Boltzmann, Birkhoff, Poincaré for studying the solutions of linear differential equations. Now this theory is a rapidly developing area of mathematics which has numerous applications in related areas such as classical mechanics, differential geometry, the theory of stochastic processes, the theory of operator algebras and number theory. Dynamical systems theory deals with the long-term qualitative behaviour of dynamical systems. Here, the focus is not on finding precise solutions to the equations defining the dynamical system, but rather to answer questions like "Does the long-term behavior of the system depend on its initial condition?" or "Will the system settle down to a steady state in the long term?" The mathematical theory of dynamical systems has applications in physics, economy, biology, sociology, etc.

In mathematics, a dynamical system is a triple consisting of a phase space, time, and a time evolution law. The phase space is a set with some additional structure, like topology (in topological dynamics) or a family of measurable sets (in ergodic theory). Time may be discrete or continuous and may be reversible or irreversible. In the project, we will focus on the discrete dynamical systems, for which the action of time is defined by iterates of a single map, so this map itself is usually referred to as the dynamical system. Most of the main dynamical phenomena are apparent already in the discrete-time case, with only some layers of technicality added in the corresponding continuous-time setting.

Cantor dynamical systems are among the most important classes of discrete dynamical systems in topological dynamics, which provide models for general dynamics. Moreover, due to the structure of a Cantor set, the theory of Cantor dynamical systems is a natural link between ergodic theory (called also measurable dynamics) and topological dynamics. Ergodic theory studies statistical properties of deterministic dynamical systems, while topological dynamics studies asymptotic properties of dynamical systems from the viewpoint of general topology. A Cantor set is a zero-dimensional compact metric space without isolated points. The topology on a Cantor set is generated by a countable family of clopen subsets. All Cantor sets are homeomorphic. By a Cantor dynamical system we mean a pair (X, T) consisting of a Cantor set X and a homeomorphism $T : X \to X$. Cantor dynamical systems are one of the main objects of study in symbolic dynamics. Symbolic dynamical systems originated as a method to study general dynamical systems, later the developed techniques and ideas found significant applications in data storage and transmission as well as linear algebra.

The project is devoted to the classification of aperiodic Cantor dynamical systems with respect to orbit equivalence. We will investigate the properties of Cantor dynamical systems such as their complexity, the sets of invariant and quasi-invariant measures, full groups. These objects will help us to distinguish non-isomorphic or non-orbit equivalent systems. The problems considered in the project have connections to the theory of operator algebras, group theory, probability theory, etc.