SCMS Seminar

LYAPUNOV SPECTRUM FOR PLANAR SELF-AFFINE SETS

Speaker: Michal Rams

Polish Academy of Sciences, Institute of Mathematics

Lecture

Time: 15:00 - 16:00, Monday, Nov. 18, 2019

Venue: Room 110, Shanghai Center for Mathematical Sciences

Abstract: An iterated function system (IFS) is a finite family of contractions $(f_i)_i$ from a metric space (in our case $\mathbb R^2$) to itself. The IFS is affine when the maps are affine, i.e. in the form $f_i(x)=A_i x + a_i$, with $A_i\in GL(2,\mathbb R)$ and $a_i\in \mathbb R^2$. The affine IFS is strongly irregular when there is no hyperplane (in our twodimensional case - line) preserved by all the matrices A_i. The limit set of an IFS is the unique nonempty compact set satisfying $\Lambda = \bigcup f_i(\Lambda)$. The IFS satisfies strong open set condition when there exists a nonempty open set U such that the images of $\overline U$ are disjoint and contained in U. In particular, the sets $f_i(\Lambda)$ are then disjoint, and hence we can define the inverse map $F(x)=f_i^{-1}(x)$ for $x\in f_i(\Lambda)$.

For a strongly irreducible planar self-affine IFS satisfying the strong open set condition we consider the multifractal theory for the dynamical system (Λ, F). It has two parts: for the Birkhoff spectrum we consider some potential $\phi:\Lambda\to \mathbb R$ and for every $x\in \Lambda$ we calculate the Birkhoff average $B_\phi(x)=\lim_{n\to\infty} \frac 1n \sum_{i=0}^{n-1} \phi(F^i(x))$. For the Lyapunov spectrum we calculate $L(x)$ as the Lyapunov exponent of the map F at x. Both functions are well defined almost everywhere (in the sense: for every F-invariant measure μ B_ϕ and L are defined almost everywhere). We will calculate the size of the level sets of B_ϕ and L, both in the sense of topological entropy and in the sense of Hausdorff dimension.

This is a joint work with Balazs Barany, Thomas Jordan, and Antti Kaenmaki.

Shanghai Center for Mathematical Sciences
2005 Songhu Road,Yangpu District, Shanghai, China
Tel: 31243880 Fax: 31244000 Postcode: 200433 Email: scms@fudan.edu.cn