THE WEIZMANN INSTITUTE OF SCIENCE
FACULTY OF MATHEMATICS AND COMPUTER SCIENCE

Mathematical Analysis and Applications Seminar

Room 1, Ziskind Building
on Tuesday, Oct 20, 2015
at 11:15

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Reversed mixed dynamics

Abstract:

We say that a system possesses a mixed dynamics if
1) it has infinitely many hyperbolic periodic orbits of all possible types (stable, unstable, saddle) and
2) the closures of the sets of orbits of different types have nonempty intersections.

Recall that Newhouse regions are open domains (from the space of smooth dynamical systems) in which systems with homoclinic tangencies are dense. Newhouse regions in which systems with mixed dynamics are generic (compose residual subsets) are called absolute Newhouse regions or Newhouse regions with mixed dynamics. Their existence was proved in the paper [1] for the case of 2d diffeomorphisms close to a diffeomorphism with a nontransversal heteroclinic cycle containing two fixed (periodic) points with the Jacobians less and greater than 1. Fundamentally, that "mixed dynamics" is the universal property of reversible chaotic systems. Moreover, in this case generic systems from absolute Newhouse regions have infinitely many stable, unstable, saddle and symmetric elliptic periodic orbits [2,3].

As well-known, reversible systems are often met in applications and they can demonstrate a chaotic orbit behavior. However, the phenomenon of mixed dynamics means that this chaos can not be associated with "strange attractor" or "conservative chaos". Attractors and repellers have here a nonempty intersection containing symmetric orbits (elliptic and saddle ones) but do not coincide, since periodic sinks (sources) do not belong to the repeller (attractor). Therefore, "mixed dynamics" should be considered as a new form of dynamical chaos posed between "strange attractor" and "conservative chaos".

These and related questions are discussed in the talk. Moreover, the main attention here is paid to the development of the concept of mixed dynamics for two-dimensional reversible maps. The main elements of this concept are presented in section below.
