Department of Mathematics and Computer Science

Friday, September 29, 2017, 4:10 pm

COLLOQUIUM TALK

Speaker: Gregory Galperin (EIU)

Old Main 2231

Jumping Electrons and Jumping Spheres

Abstract:

This is the second talk in the series of **two EUI Friday Colloquiums** (September 22 & 29, 2017). In both talks, I formulate and solve two math problems, solutions to which are based on the idea of applying a tricky function to the system configurations. The titles of the talks are "**Jumping Electrons**" and "**Jumping Spheres**." Both talks are quite accessible to a general audience, especially for students.

* * *

In my second talk called "**Jumping Spheres**", I will discuss the following problem.

PROBLEM: There are massive points, or point-like masses, and a sphere of radius R centered at point O_0 in space $\mathbb{R}^n$; the sphere contains a part of these points inside it. Calculate the center of mass, O_1, of the points situated inside the sphere (the vector *arithmetic mean* in the case when all the masses are equal to 1) and shift the sphere so that its new center coincides with O_1. The sphere just jumps from its old position O_0 to its new position O_1. The new sphere contains another points inside it, so repeat the same process once again: calculate the center of mass of these points, O_2, and move the sphere to its new position O_2 from the old position O_1. Then repeat/iterate this process infinitely many times according to the rule described.

QUESTION: *What is (are) the final state(s) of the sphere? Will the sphere jump infinitely long shifting after each iteration to a new position or will it stop at some step number n, in which case $O_n = O_{n+1} = O_{n+2} = \ldots$? Does the answer depend on whether the set of the point-like masses in space is finite or is infinite?*

In my talk, I will solve the problem on jumping spheres for both finite and infinite sets of points.

My solution for the "jumping spheres" will involve a special function that relates to the "**moment of inertia**", the notion borrowed from physics. Monotonically decreasing of this function along the trajectory of the jumping sphere is a key to the solution of the problem.

SNACKS IN FACULTY LOUNGE AT 3:30 PM.
EVERYONE WELCOME (EVEN IF YOU ARE UNABLE TO ATTEND THE TALK)