Karlsruhe Institute of Technology

Seminar of the Work Group
Nonlinear Partial Differential Equations
WS 21/22

Speaker:Airi Takeuchi
October 26, 2021, 14:00 - 15:30
Seminar room: 3.068

Conformal transformations on integrable mechanical billiards

KIT

Abstract

The integrability of the free billiards in the plane has been firstly studied by G. D. Birkhoff. Later, Y. G. Sinai examined their chaotic behavior and ergodicity. L. Boltzmann proposed mechanical billiard systems in the presence of a central force, and he expected such billiards with a line not passing through the center as a reflection wall to be ergodic. Recently, by Gallavotti and Jauslin, it has been shown that such billiards under the Kepler potential are actually integrable. In this talk, we explain that several integrable mechanical billiards, including Boltzmann's integrable billiards, are connected via conformal transformations. As an application, we show that any focused conic section gives rise to integrable Kepler billiards, which can be seen as a generalization of a previous work of Gallavotti-Jauslin. We also show that any confocal conic sections give rise to integrable billiard systems of Euler's two-center problems.
This talk is based on a joint work with Lei Zhao from University of Augsburg.