



DynamIST

From Reeb dynamics to fluid computers: two faces of a mirror

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Host: Kaloshin Group

Is hydrodynamics capable of performing computations? (Moore 1991). Can a mechanical system (including a fluid flow) simulate a universal Turing machine? (Tao, 2016). Etnyre and Ghrist unveiled a mirror between contact geometry and fluid dynamics reflecting Reeb vector fields as Beltrami vector fields. With the aid of this mirror, we can answer the questions raised by Moore and Tao by combining techniques developed by Alan Turing with modern Geometry (contact geometry) to construct a "Fluid computer" in dimension 3. This construction shows, in particular, the existence of undecidable fluid paths. The contact mirror has enabled the use of advanced geometric techniques, such as the h-principle, in fluid dynamics, opening up new avenues for exploring the behavior of complex fluid systems. I will also explain an application of this mirror and the h-principle to prove that Euler flows can be seen as universal models for dynamical systems. The study of these universality features was suggested by Tao as a novel way to address the problem of global existence for Euler and Navier-Stokes equations.

Friday, March 24, 2023 02:00pm - 03:00pm

Heinzel Seminar Room / Office Bldg West (I21.EG.101)



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