Requests for Collaboration

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Research Interests

- Theoretical Fluid dynamics and Magnetohydrodynamics (Fluid instabilities and vortex dynamics)
- Nonlinear dynamical systems (Chaos, integrable and non-integrable systems)

Creative Achievements in the Application of New and Existing Science and Technology

(1) A theoretical model was proposed to describe fully nonlinear dynamics of interfaces in MHD flows based on an idea of the non-uniform current-vortex sheet [1,5]. The model well describes the magnetic field amplification in Supernova remnants (SNRs) by vortices and the suppression of fluid instabilities by a magnetic field. These phenomena are critical in astrophysics and inertial confinement fusion [1]. **(2)** A novel analytic function that can describe the stable and unstable manifolds of Henon map was found [4]. Using this function, the topological entropy and Lyapunov exponent were calculated very accurately [2, 3].

Technology (Product, Process, Device, Service etc.) That I Want to Request

- Applied mathematics and computer simulations
- Pattern formations (Paste, complex fluid)
- Nonlinear mathematics and physics

A list of 5 key publications

[1] C. Matsuoka, K. Nishihara and T. Sano, Nonlinear dynamics of non-uniform current-vortex sheets in magnetohydrodynamic flows, J. Nonlinear Sci., Vol. 27, 531-572 (2017).

[2] C. Matsuoka and K.. Hiraide, Computation of entropy and Lyapunov exponent by a shift transform, Chaos, Vol. 25, 103110_1-6 (2015).

[3] C. Matsuoka and K.. Hiraide, Entropy estimation of the Henon attractor, Chaos Solitons Fractals, Vol. 45, 805-809 (2012).

[4] C. Matsuoka and K.. Hiraide, Special functions created by Borel-Laplace transform of Henon map, Electro. Res. Ann. Math. Sci., Vol. 18, 1-11 (2011).

[5] C. Matsuoka, Renormalization group approach to interfacial motion in incompressible Richtmyer-Meshkov instability, Phys. Rev. E, Vol. 82, 171009_1-9 (2010).