

Discrete and Continuous Lagrangian Descriptors for Hamiltonian systems.

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The goal of this work is to discuss the generalization of the method of Lagrangian descriptors [3]. This method visualizes the phase space structure of Hamiltonian systems, in particular the stable and unstable manifolds of hyperbolic trajectories, in the case of both discrete [1] and continuous [2] dynamical systems. Such a method consists of the sum of the p-norm of the velocity field evaluated on the trajectory of points. In this work we discuss formal proofs on why this method highlights invariant manifolds. ACKNOWLEDGEMENTS. The research of C. Lopesino is supported by the MINECO under grant MTM2014-56392-R within the ICMAT Severo Ochoa project SEV-2011-0087. SW is Supported by ONR Grant No. N00014-01-1-0769. REFERENCES [1] Lopesino, C., Balibrea, F., Wiggins, S., Mancho, A.M. Lagrangian Descriptors for Two Dimensional, Area Preserving Autonomous and Nonautonomous Maps. *Communications in Nonlinear Science and Numerical Simulation*, 27, pp. 40-51, 2015. [2] Lopesino, C., Balibrea-Iniesta, F., Garcia-Garrido, V. J., Wiggins, S., Mancho, A.M. A theoretical framework for Lagrangian descriptors. Submitted. [3] Mancho, A.M., Wiggins, S., Curbelo, J., and Mendoza, C. Lagrangian descriptors: A method for revealing phase space structures of general time dependent dynamical systems. *Communications in Nonlinear Science and Numerical Simulation*, 18(12), 3530 - 3557, 2013.