A Novel Method to Distinguish between Quasiperiodicity and High Periodicity

Poster

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Although the phenomenon of quasiperiodicity is widely studied in the literature, the procedure to distinguish a quasiperiodic motion with a motion of very high periodicity still remains clouded. It is assumed that we can only comment on the behavior within the precision of our measurement and computing machinery. We propose

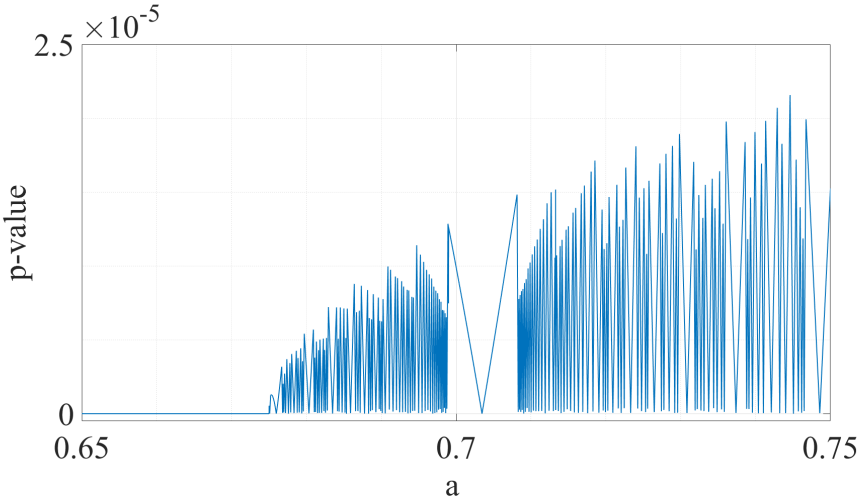

Figure 12: P-value diagram

a new approach to tackle this problem based on the evolution of perturbations to the state in the phase space. To do this, we first obtain two closely spaced points on the invariant closed curve (ICC). We evolve these two points and compute the Euclidean distance between them as time progresses. We show that in the case of high periodicity, this distance, which we call the *p-value*, asymptotically dies down, whereas it remains of the same order of magnitude as the initial perturbation for a quasiperiodic orbit. We present methods of appropriately placing two closely spaced points on the ICC and avoiding the numerical artifacts that may give abnormally high p-values. By plotting the p-value against the parameter, we obtain *p-value-diagrams* (an example is given in Fig. 12). We show that certain 'V-patterns' in these diagrams help us demarcate periodic windows up to a predefined maximum value of periodicity.