

Transition of Transient behaviour due to Exceptional point
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Abstract: In the eigenvalue problem of a non-Hermitian matrix, an exceptional point (EP) is a square-root branch point on a two-dimensional parameter space, at which not only eigenvalues but also the associated eigenvectors coalesce. The peculiar feature related to the EP is the exchange of eigenvalues and eigenvectors after a parameter variation encircling the EP once, of which topological structure is same as that of Mobius strip. We studied how EP point cause drastic change in the transient behavior of systems. In the case of coupled damping oscillators, it is shown that there is qualitative difference in transient dynamics exhibiting transition from beating to simple oscillatory damping, and the transient time minimized near EP point. We also investigated the transient dynamics in synchronization between two coupled chaotic oscillators, and observed qualitative changes in transient behavior, which does not come from the stability of synchronization manifold. Based on this general result on EP, we will discuss how an observed data should be analyzed in the presence of noise.