

Abstract Submitted  
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**Matched Bipartite Digraph Representation of Generalized Dynamical System Formed by One-way Barriers**<sup>1</sup> JOHN LI<sup>2</sup>, Univ of Southern California, JOHN MAHONEY, KEVIN MITCHELL, Univ of California, Merced, TOM SOLOMON COLLABORATION<sup>3</sup> — We studied a dynamical system with stable and unstable manifolds that behave as one-way barriers, instead of separatrices in traditional dynamical system that are two-way barriers. This asymmetry gives rise to a richer dynamical behavior such as the overlapping of basins of attraction. The recently developed *Burning Invariant Manifold* (BIM) theory took a dynamical system approach to understand front propagation in Advection-Reaction-Diffusion systems, which have BIMs as the one-way barriers. Through numerical simulations under BIM theory, we found that although both unstable and stable BIMs are one-way barriers, unstable BIMs are the ones that we can experimentally observe the fronts converging onto, and the stable BIMs act as the basin boundaries. We further hypothesized a duality relation between the stable and unstable BIMs. Under the duality hypothesis, we developed a mechanism of the behavior of the system by reducing it back to a traditional system based on topology, and we found a simplification of the system by to summarize the topological information into a Matched Bipartite directed graph (MB digraph).

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