

Title:

Conservative vs. non-conservative diffusion towards a target in a networked environment
Ernesto Estrada

Abstract:

The networked nature of complex systems determines the way in which 'information' navigates the system from a source to a target. This navigation is governed by the lack of central controllers and the fact that every individual entity ignores the global structure of the system. Consequently, targeted shortest-path searches are almost automatically excluded in these systems, leaving the more blind diffusive processes as the main mechanism for navigating complex networks. Here I will show that non-conservative diffusion has some advantages over the 'classical' (conservative) diffusion for searching a target in a network. The non-conservative nature of the diffusion process is given by the possibility that the network 'communicates' with the environment in which it is embedded. I will use analytical and computational methods to show that non-conservative diffusion uses trajectories which are more prone to find a target than the conservative one. I will illustrate the existence of this mechanism in systems as varied as traffic in urban environments, volume transmission in the brain and communication through online social networks.