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Trickle-down processes and their boundaries

It is possible to represent a number of Markov chains that appear in applications of probability to computer science as an evolving sequence of connected subsets of a directed acyclic graph that grow in the following way: initially, all vertices of the graph are unoccupied, particles are fed in one-by-one at a distinguished source vertex, successive particles proceed along directed edges according to an appropriate stochastic mechanism, and each particle comes to rest once it encounters an unoccupied vertex. Examples include the binary and digital search tree processes, the random recursive tree process and generalizations of it arising from nested instances of Pitman's two-parameter Chinese restaurant process, tree-growth models associated with Mallows' ϕ model of random permutations and with Schützenberger's non-commutative q-binomial theorem, and a construction due to Luczak and Winkler that grows uniform random binary trees in a Markovian manner. I will introduce a general framework that encompasses such Markov chains and then characterize their asymptotic behavior by analyzing in detail their Doob-Martin compactifications, Poisson boundaries and tail σ-fields. This is joint work with Rudolf Grübel and Anton Wakolbinger.