

1135-05-1376 **Tad P. White*** (tad@super.org). *Quota Trees*.

Given a nonnegative integer “quota” for each vertex of a directed multigraph G , a **quota tree** is an immersed rooted tree which hits each vertex of G the prescribed number of times. When the quotas are all one, the tree is actually embedded and we recover the usual notion of a spanning arborescence (directed spanning tree). The usual algorithms which produce spanning arborescences with various properties typically have (sometimes more complicated) “quota” analogues.

One context in which quota trees arise is in characterizing the sizes of the Myhill-Nerode equivalence classes in a connected deterministic finite-state automaton recognizing a given regular language. The obstruction to realizing a given set of M-N class sizes is precisely the existence of a suitable quota tree.

We give necessary and sufficient conditions for the existence of a quota tree (or forest) over a given directed graph with specified quotas, solving the M-N class size problem as a special case. We derive a formula for the number of such quota trees, which generalizes both the matrix-tree theorem and Cayley’s formula for counting labeled trees. We show how to sample uniformly from the set of forests with given quotas, and how to compute a minimum-weight quota forest. (Received September 25, 2017)