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Competitive search in symmetric trees

A familiar quandary arises when there are several possible approaches that might lead to the solution of a problem, but no way of knowing which, if any, are viable for a particular problem instance. Faced with this uncertainty, one is forced to explore alternative approaches through a coordinated interleaving process. As usual, the objective is to minimize the total exploration cost.

Popular formulations of such problems include variants of the *cow-path problem*: search, among a collection of disjoint paths that emanate from some junction point, for a goal (pasture) located at some unknown distance along one of the paths. Much of the existing work has assumed that at most one of the alternatives is viable, providing support for a competitive analysis of algorithms, using the cost of the unique viable alternative as a benchmark. Recently more attention has been devoted to versions in which there may be multiple viable solutions (think of cow-paths with many, equally satisfactory, goals), and arguably-optimal universal search strategies have been formulated in this richer setting.

In this talk we look at the same multi-goal search problem when the search domain is modeled as a symmetric tree. In so doing our hope is to reflect more accurately the fact that alternative solutions to natural problems may have much in common, deviating only at clearly defined decision/branch points. We describe optimal competitive search strategies in this context that generalize earlier results on the m-ray cow-path problem.

[Based on joint work with Sandra Zilles, University of Regina]