Online Supplement for "A comparison of Monte Carlo tree search and rolling horizon optimization for large-scale dynamic resource allocation problems"

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A Calibration of wildfire fluid model parameters

Given parameters for the original MDP formulation of the tactical wildfire management problem, parameters for our optimization formulation in Section 3.1 are set as follows:

- $\bar{I}_t(x)$ is computed by iterating a modified version of the one-step recursion, assuming that there is no intervention and infinite fuel:

$$\bar{I}_t(x) = \bar{I}_{t-1}(x) + \sum_{y \in \mathcal{N}(x)} \bar{I}_{t-1}(y),$$

  where $\bar{I}_0(x) = I_0(x)$. In this modified one-step recursion, each transmission rate $\zeta_t(y, x)$ is essentially assumed to be 1, which is the highest value it can be.

- $F_0(x)$ is obtained by summing the fuel threshold δ and the $\bar{I}_t(x)$ values over the horizon $t = 0, 1, \ldots, \min\{T, F(x)\}$, where $F(x)$ is the number of periods that cell x can burn into the future according to the original MDP dynamics:

$$F_0(x) = \delta + \sum_{t=0}^{\min\{T, F(x)\}} \bar{I}_t(x).$$

  Intuitively, since the intensity $I_t(x)$ can be thought of as how much fuel was consumed by the fire in cell x at time t, the initial fuel value $F_0(x)$ can be thought of as a limit on the cumulative intensity in a cell over the entire horizon. Once the cumulative intensity has reached $\sum_{t=0}^{\min\{T,F(x)\}} \bar{I}_t(x)$, the fuel in the cell enters the interval $[0, \delta]$, at which point the variable $z_t(x)$ is forced to 1 and the intensity is forced to zero for all remaining time periods.

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- $\zeta_t(y, x)$ is set to $P(x, y)$ (the transmission probability from y to x) for each t.
- $\tilde{\zeta}_t(x, i)$ is set to $Q(x)$ (the probability of successful extinguishing a fire in cell x) for each period t and each suppression team i.
- δ is set to 0.1.