# Sensitivity of the clustering parameter in a spatial heuristic algorithm.

The spatial heuristic algorithm is a co-evolutionary cellular automata optimization heuristic developed by Heinonen and Pukkala (2007). The objective function of the model is to maximize the net benefit of achieving constraints related to harvest flow, landcover and spatial clustering of forest values. The first two are considered global constraints within the algorithm while the spatial clustering is a local constraint that leverages the cellular automata framework to incentivize the algorithm to select states similar to their neighbours.

In this test, we focus on the sensitivity of the clustering parameter ageCluster which is bounded between 0 and 1. As ageCluster increases it provides greater incentive for cells to choose states that are more like their neighbours. Specifically, the ageCluster assesses the proportion of neighbours that are > 140 years in each time period and incentivizes a cell to choose a state that results in > 140 years of age in the same time periods.

### Methods

Initial forest was created as a random gaussian field age class distribution (10 x 10 raster each representing 1 ha cells). Planning horizon = 200 years in 5 year periods. White pixels are age =0 which are “cutblocks”.

Graphical user interface, application

Description automatically generated with medium confidence

Harvest flow between 200-1100 m3 per 5 years (ie., ~ 1 cell per time-period). Minimum harvest volume = 150 m3 per ha. Landcover constraint: 29% of the area to be > 140 years of age. Initial landscape has 32% of the area > 140 years. Through out the planning horizon growing stock > 50% of the initial amount of growing stock.

## Results

The spatial outcomes of the different parameterizations of the algorithm adjusting the ageClusterWeight parameter and holding the remainder of the parameter’s constant. Panel graphs to be read: top left to bottom right= 25, 50, 75, 100, 125 an 150 years in the future.

Chart, treemap chart

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