Resistant Kernel Algorithm

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Revised December 16, 2010

This algorithm creates a resistant kernel for a focal cell, based upon a dispersal parameter, a cost matrix, and a maximum search distance (included for computational efficiency). It is repeated for each focal cell in the landscape, and results are summed to give the resistant kernel estimator.

Resistant kernel(h,K,s)
    Create working grid G filled with 0
    $G_{ij} = s \cdot h$; starting "spread value" in focal cell
    Repeat,
        $G_{kl} = |G_{kl}|$; start with highest active spread value
        For each neighbor G_{kl} of G_{ij},
            If $G_{kl} \le 0$, ; subtract cost of each active neighbor
                $t = \max\left(0, G_{ij} - K_{kl} \cdot \left(\sqrt{2} \text{ if diagonal, else } 1\right)\right)$
                If $t > |G_{kl}|$,
                    $G_{kl} = -t$
        ij = location of minimum value in G ; find highest active spread value
    Until $G_{ij} \ge 0$; loop until no active values
    R_{ij} = zdensity($s - G_{ij} \div h$) ; scale results by normal distribution

Where

h = Standard deviation of dispersal distance in optimal cover type (in cells)
K = Cost grid, filled with cost for each cell based on cover type
s = Search distance (in units of h; e.g., s = 3 will create 99.7% kernel)
G = Working grid
R_{ij} = Resistant kernel for focal cell i,j

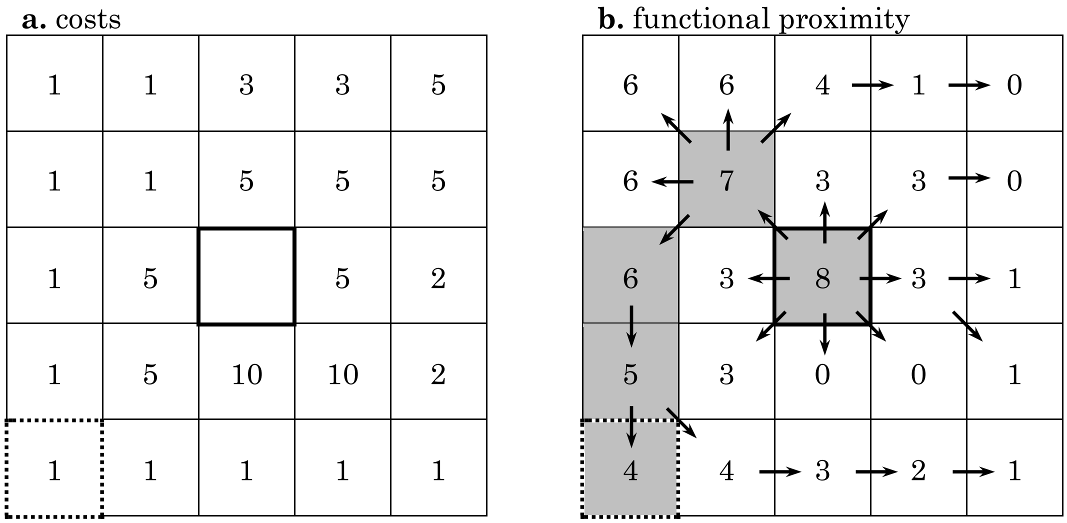

Fig. 1. An example of least-cost paths used to build a resistant kernel for a focal cell, outlined at center. a) cost matrix; b) resulting functional proximity (the complement of functional distance) to the focal cell (with starting value of 8) in each cell. The least-cost path from the focal cell to the lower left cell is highlighted. For simplicity in this illustration, diagonal paths are treated the same as orthogonal paths; in the model diagonal costs are multiplied by $\sqrt{2}$. These functional proximities are scaled by a density function (e.g., a normal function) and summed across each focal cell to yield a resistant kernel surface.