1st order Spatial Statistics

Hopkins' Index of aggregation

Hopkins' index of aggregation is the ratio of the distance from a tree to its nearest neighbor and the distance from random points within the same space to their nearest neighbor tree.

$$Hop_F = \frac{\sum_{i=1}^{m} d^2_{(p-t_i)i}}{\sum_{i=1}^{m} d^2_{(t-t_i)i}}$$

where $d_{(p\text{-}ti)i}$ is the distance from a random point to its nearest neighbor tree. $d_{(t\text{-}ti)i}$ is the distance from a tree to its nearest neighbor tree. This test has a *F* distribution with *F(2m,2m)* (Hopkins, 1954).

Byth and Ripley (1980) presented standardized index based on this test as:

$$Hop_N = \frac{1}{m}\sum_{i=1}^{m}\left[\frac{d^2_{(p-t_i)i}}{d^2_{(p-t_i)i} + d^2_{(t-t_i)i}}\right]$$

This index has a Normal null distribution *N(1/2,1/12m)*.

- As Hop_N approaches 0 it indicates a more "uniform" pattern.
- As Hop_N approaches 1 it indicates a more "clustered" pattern.
- A value of 0.5 is consider random

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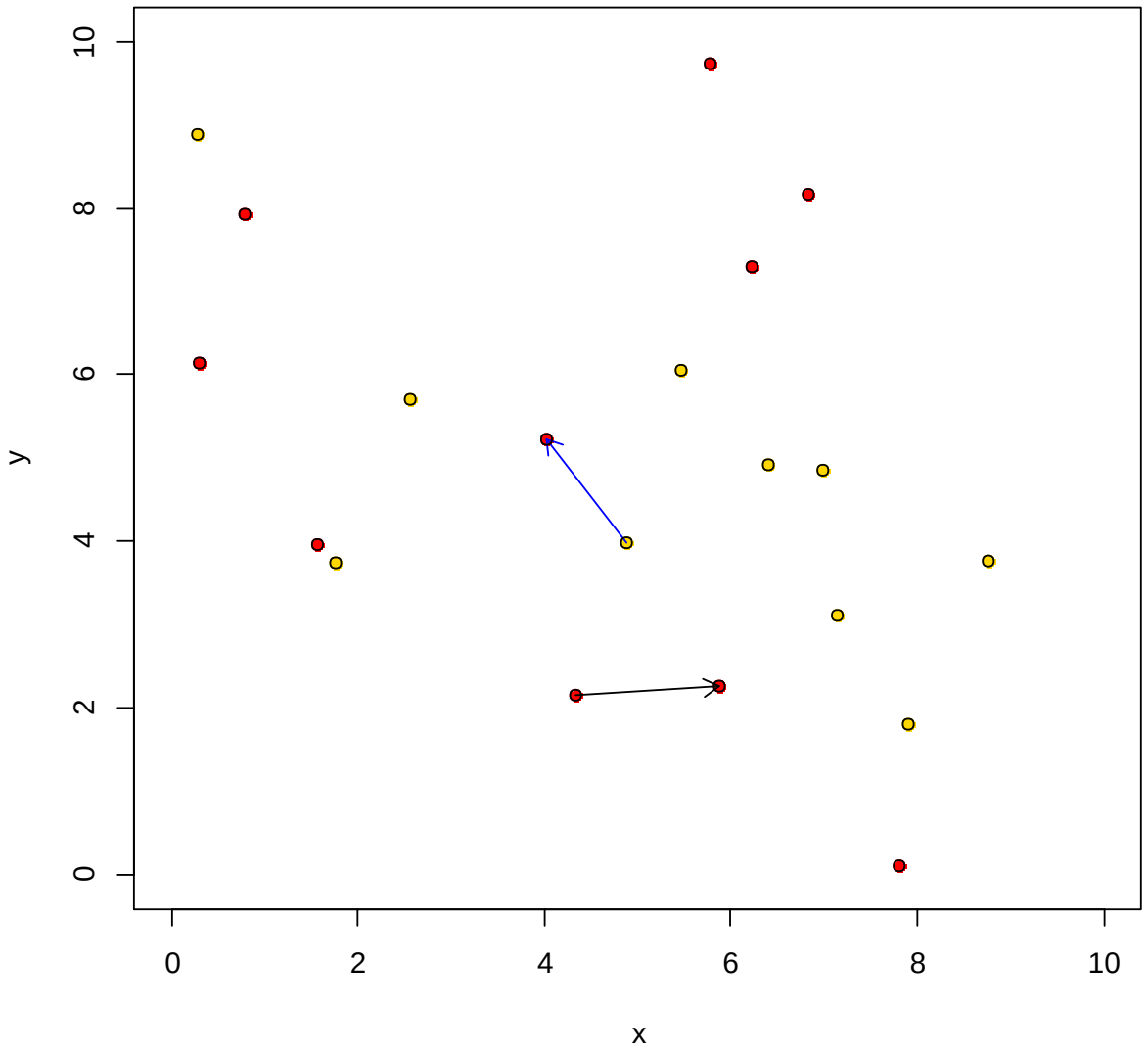

Figure 1. Example of how the Hopkins data is collected. The red dots are trees. The gold dots are random points. We collect the 1st nearest neighbor trees to the point distances and the tree to tree nearest neighbors.

Also See:

Hopkins, B. 1954. A new method for determining the type of distribution of plant individuals. *Annals of Botany* 18:213-227.

Byth, K. and B. D. Ripley. 1980. Sampling spatial patterns by distance methods. *Biometrics* 36:279-284.

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