1st order Spatial Statistics

Holgate Index

The Holgate index is based on the ratio of the distance from a random point to the first and second nearest neighbors. The Holgate are designed to have the same distributions as the Hopkins' indices.

$$Hol_F = \frac{\sum_{i=1}^{m} d^2_{(p-t_i)i}}{\sum_{i=1}^{m} d^2_{(p-t2_i)i} - \sum_{i=1}^{m} d^2_{(p-t_i)i}}$$

where $d_{(p\text{-}ti)i}$ is the distance from a random point to its nearest neighbor tree. $d_{(p\text{-}t2i)i}$ is the distance from a tree to its nearest neighbor tree. This test has a F distribution with F(2m,2m) (Holgate, 1964).

$$Hol_N = \frac{1}{m}\sum_{i=1}^{m}\left[\frac{d^2_{(p-t_i)i}}{d^2_{(p-t2_i)i}}\right]$$

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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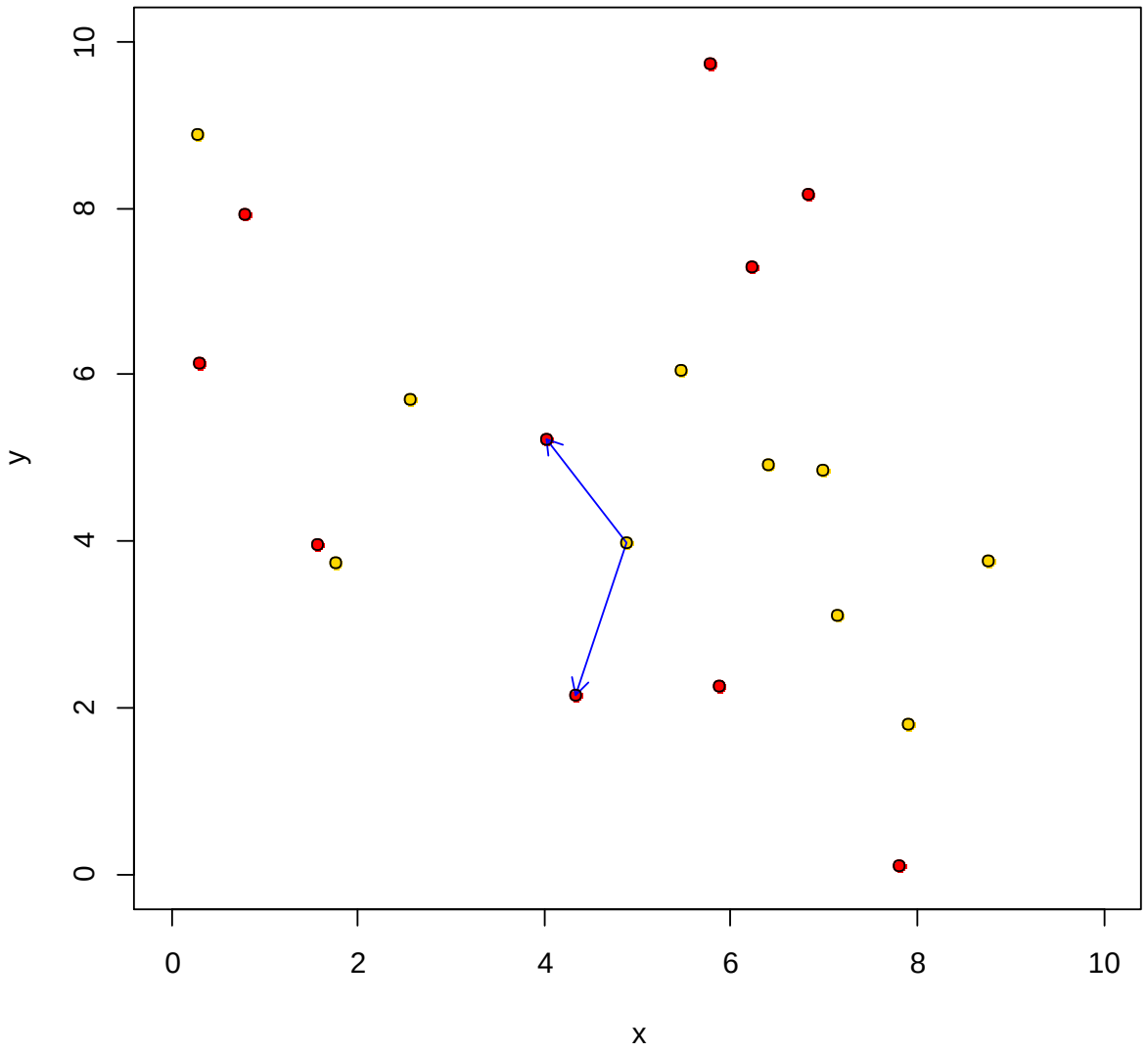

Figure 1. Example of how the Hopkins data is collected. The red dots are trees. The gold dots are random points. We collect the 1st and 2nd nearest neighbor trees to the point distances.

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Also See:

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

Holgate, P. 1964. The efficiency of nearest neighbor estimators. *Biometrics* 20:647-649.

Holgate, P. 1965. Some new tests of randomness. *Journal of Ecology* 53:261-266.

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

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