Calculating association indices

Formulas

$$HWI = \frac{x}{x + Y_{ab} + \frac{1}{2}(Y_a + Y_b)}$$

$$TWI = \frac{x}{x + 2Y_{ab} + Y_a + Y_b}$$

Variables

x = number of instances where individuals a and b were observed, associating

Y_{ab} = number of instances where individuals a and b were observed, not associating

Y_a = number of instances where individual a was observed, and individual b was not observed

Y_b = number of instances where individual b was observed, and individual a was not observed

Assumptions

In the case of GPS data with regular fix rates, all individuals are (usually) located at each "observation" and therefore, Y_a and Y_b are 0 or nearly 0.

In the case of focal observations, if we assume a single observer can only observe one group at a time, and all groups are temporally distinct, then Y_{ab} is 0. If groups are not temporally distinct (e.g.: more than one observer observing different groups at the same time), then the temporal component must be provided to calculate Y_a, Y_b and Y_{ab}.