How to measure simmilarity of species distribution recorded by quadrat mapping?

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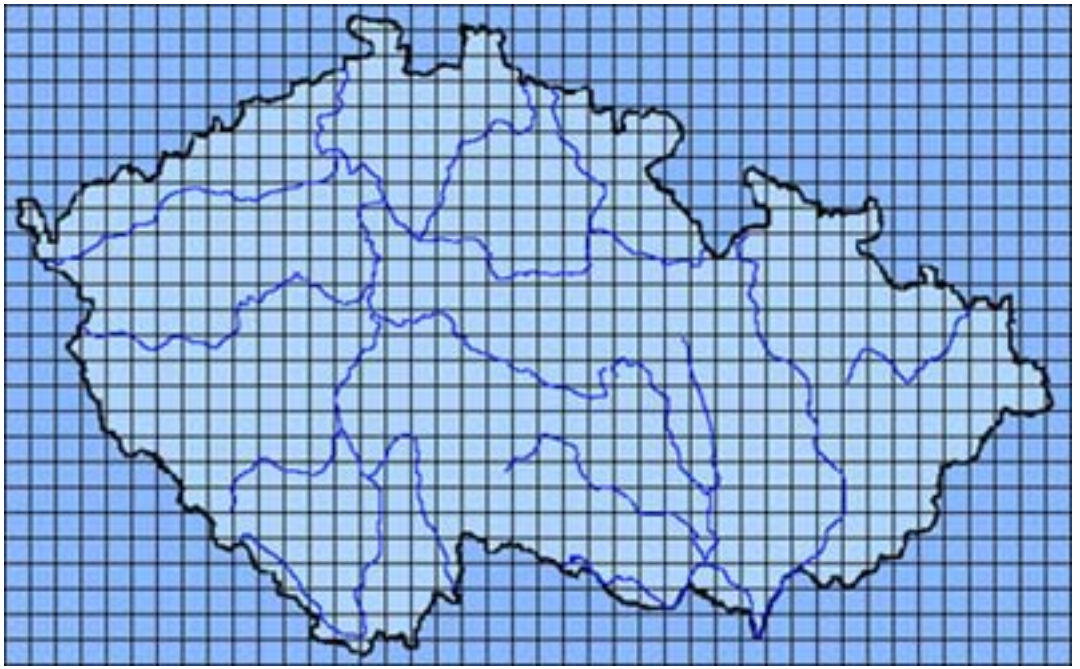
Quadrat mapping

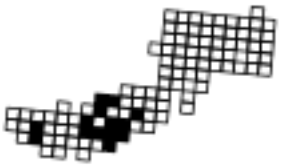
- Mostly for species distribution
- Incidence = true / false
- Quadrant mapping ~ binary grid



Examples

Argynnis adippe

Argynnis niobe



Boloria euphrosyne

Cupido decolorata

Maculinea arion

Parnassius mnemosyne

Questions

- How similar are the distributions?
  - In absolute terms?
  - In shape?
  - How big is the intersection?
- Similarity = Distance
- Generalization: How to compare binary grids?

Distance measures

- Binary distance measures
- Distance between descriptors of shape
- Earth Mover's Distance

Binary distance

- No spatial context
- Well documented
- Similarity in absolute terms

Location	Species X	Species Y
Loc 1	1	0
Loc 2	0	1
Loc 3	0	1
Loc 3	1	0
Loc 5	1	1
Loc 6	0	1

- Jaccard dist = a/(a+b+c)
- Sockal & Michener = (a+d)/(a+b+c+d)
- …

	X = 1	**X = 0**
Y = 1	a = 1	b = 3
Y = 0	c = 2	d = 0

Distance between descriptors of shape

- Descriptors of shape
  = how clustered are data? (Moran Index)

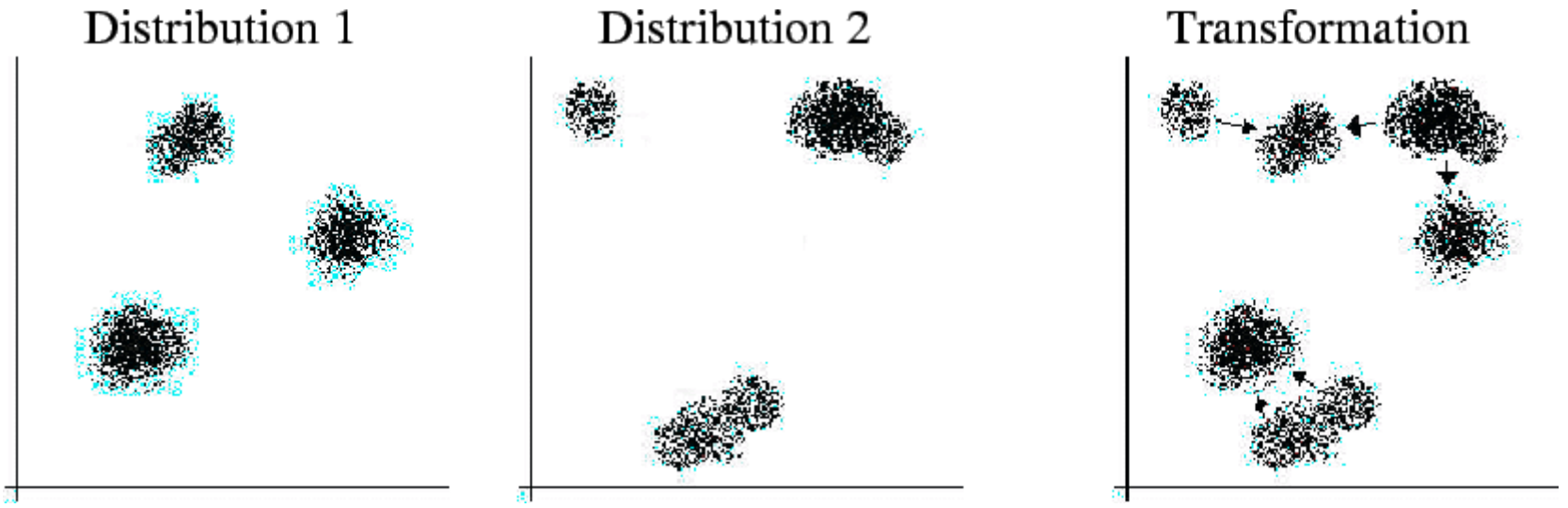
  = Is there dominant cluster? (Dominance)
  = Is the pattern dense or dispersed? (Density)
  …

- Descriptors of shape form table of values
  → Classical Euclidean distance of standardized values

- Can evaluate similarity of patterns, but not necessarily spatialy overlapping patterns

Earth Mover's Distance

- “How much energy do we need to move a pile of soil?”
- Has spatial context, but must use standardized distributions (sum of valued equal for all)



Results

- Binary distance
  - Measured only intersection, neighborhood does not matter
- Distance between similarity measures
  - Similarity of shapes, but similar shapes can be non-overlapping
- Earth Mover's Distance
  - Similarity in geographical context, but requires standardized distributions (biased, if the size of distribution is different)