

Layout Stability of Software Cities

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What is the question...

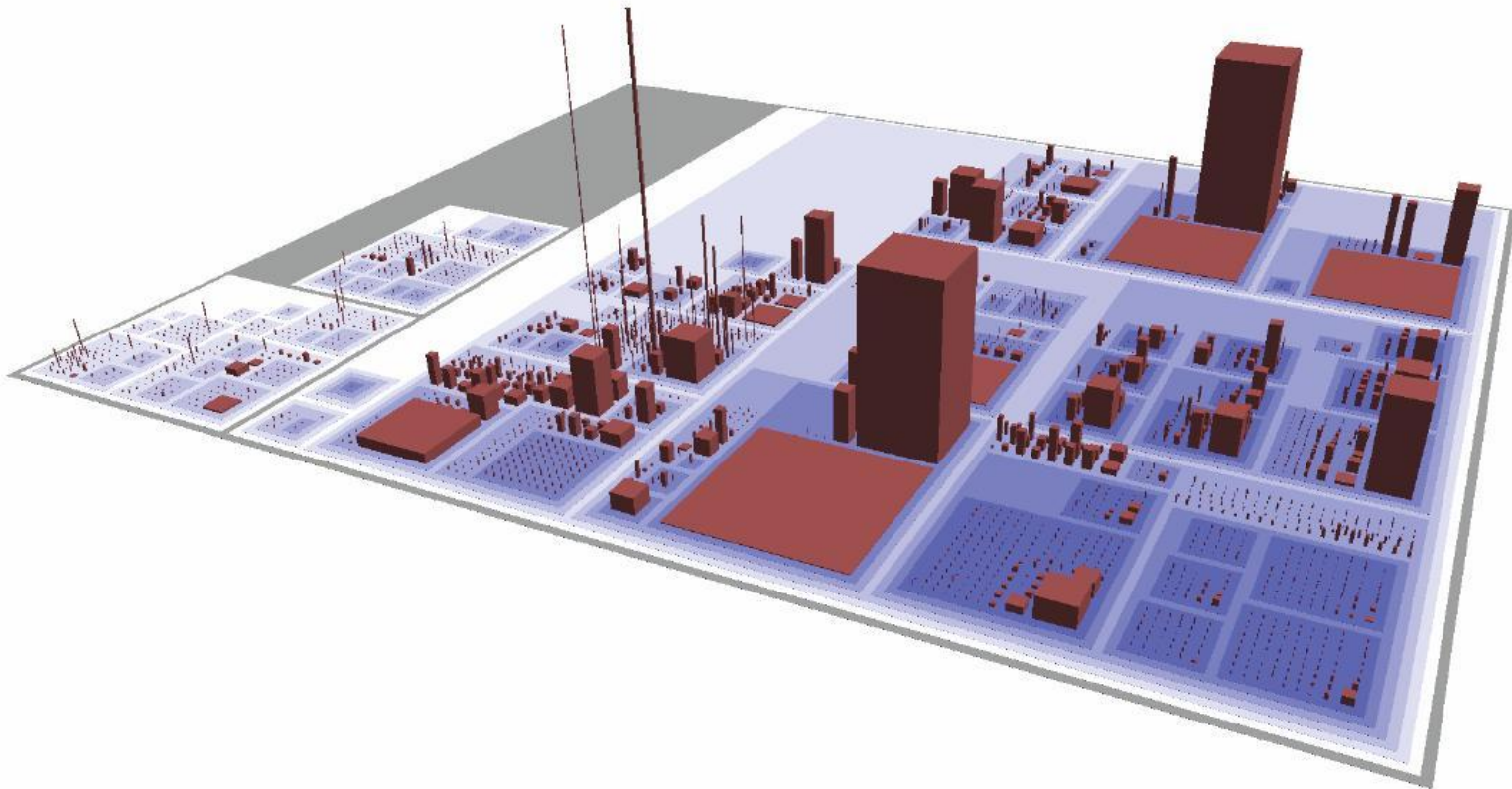
- How does the EvoStreets approach perform wrt. layout stability against other approaches?

... and what did we do?

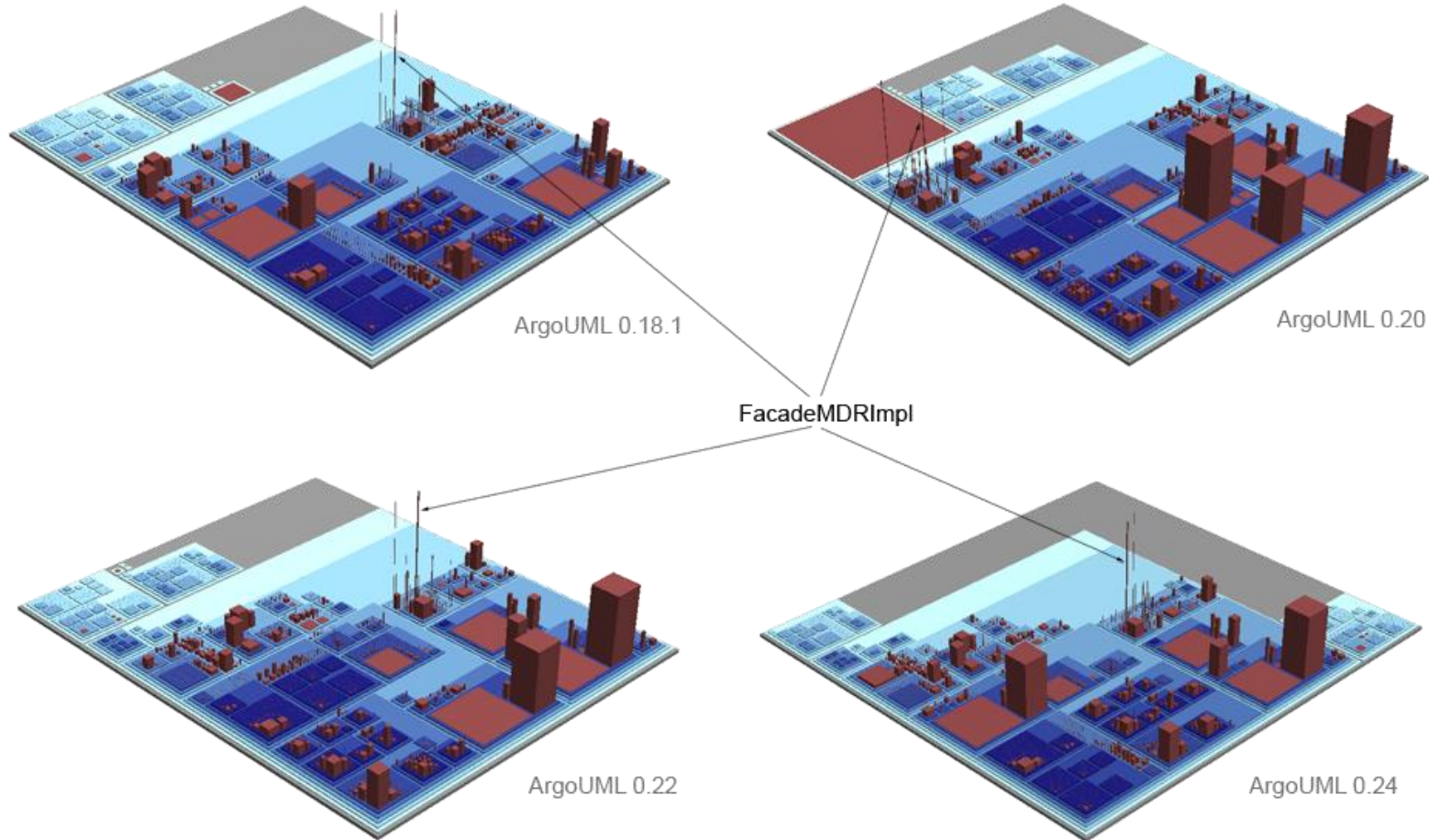
- ... 3 layout approaches,
- ... 5 similarity metrics,
- ... 5 software systems in several versions
- ... measured layout stability.

Packing Layouts

R. Wetzel and M. Lanza. *Visualizing software systems as cities.*
Proceedings VISSOFT 2007



Packing Layouts Evolution

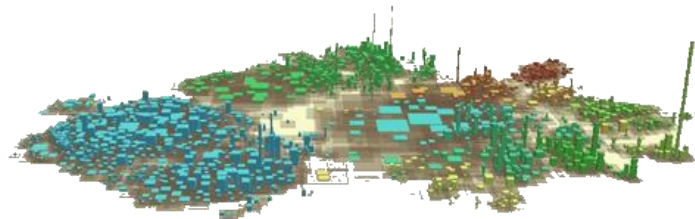


Relational Layouts

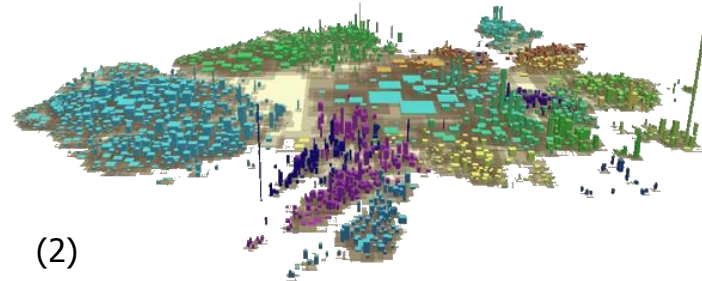
Eclipse JDT (3.000+ classes)



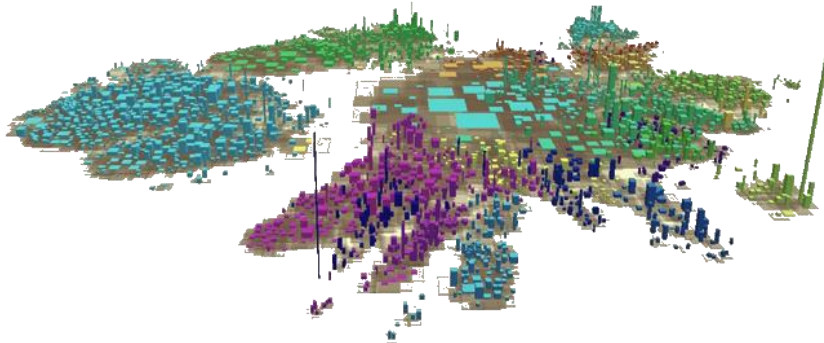
Relational Layouts Evolution



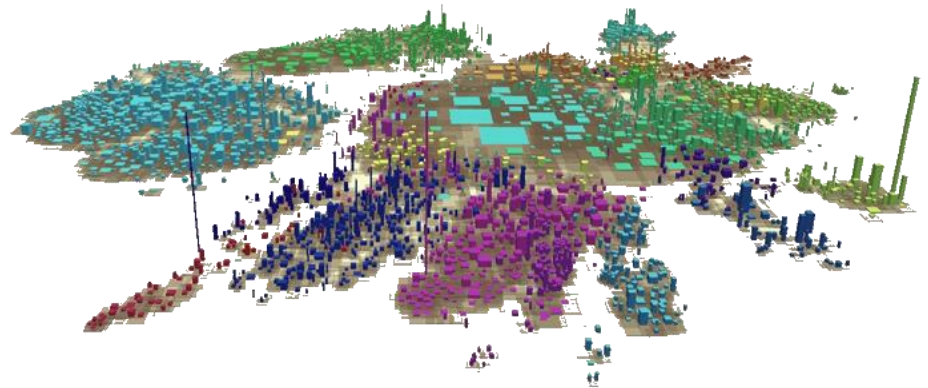
(1)



(2)



(3)

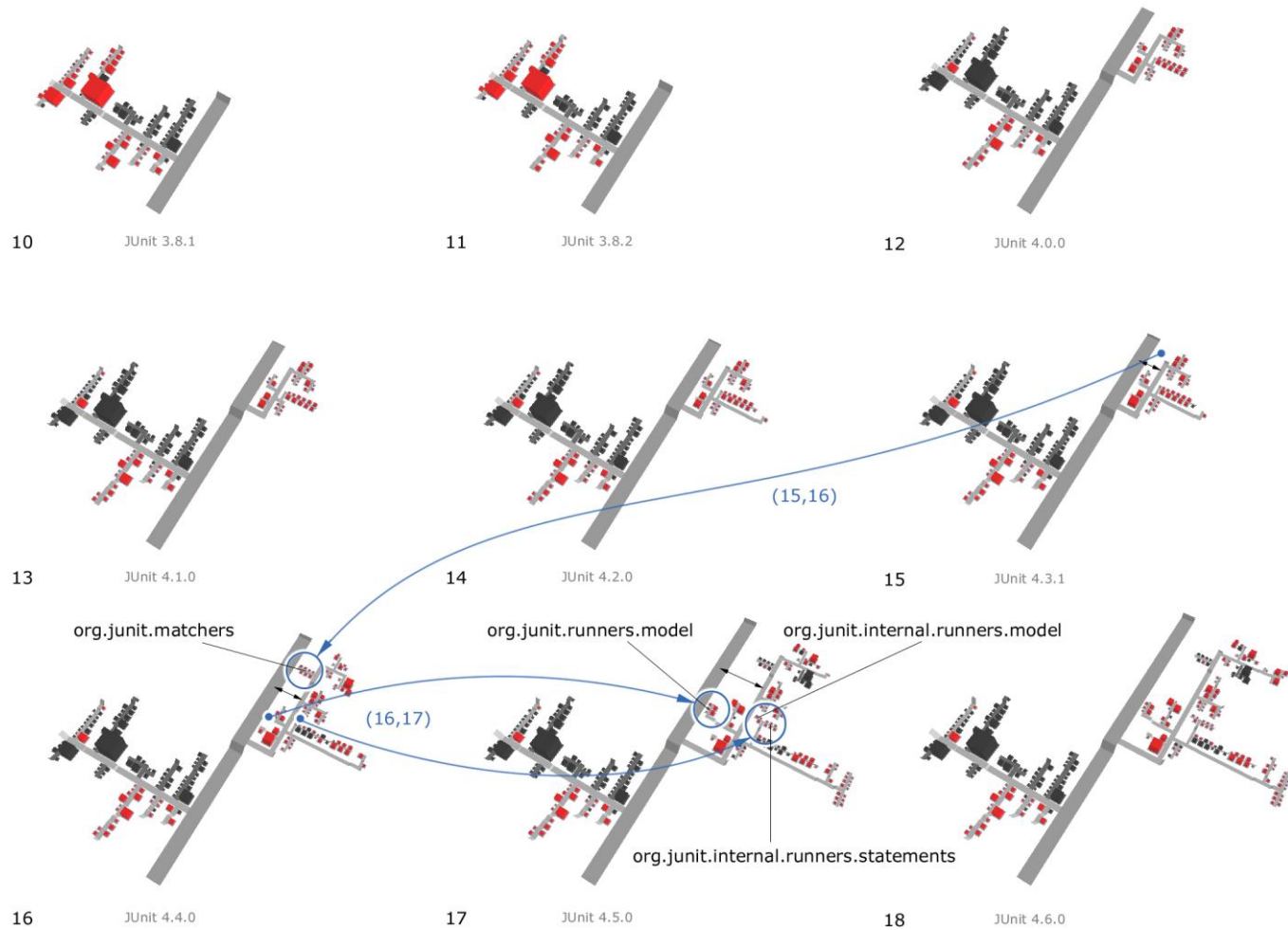


(4)

EvoStreets Layout Evolution

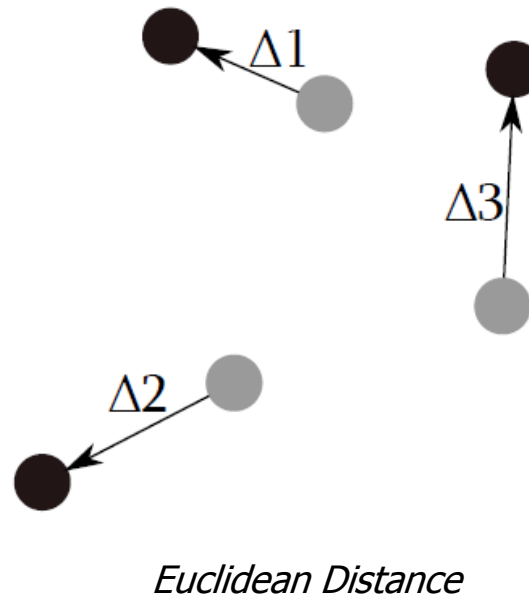


EvoStreets Layout Evolution



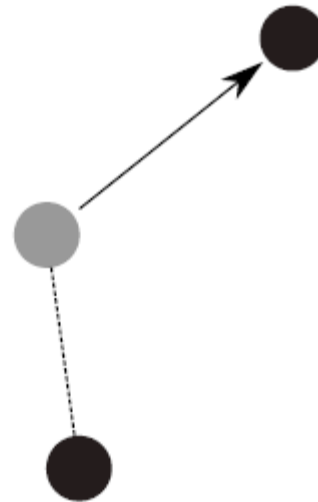
How to determine Stability?

- User study
- Measurement
 - Movements



How to determine Stability?

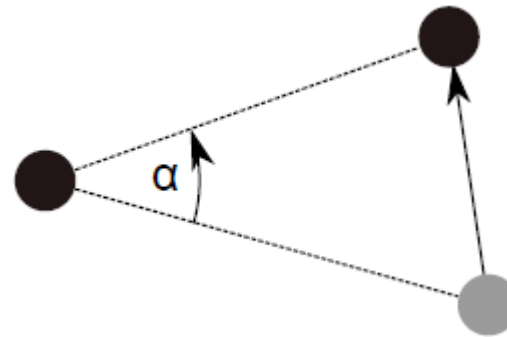
- User study
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Nearest Neighbour Between

How to determine Stability?

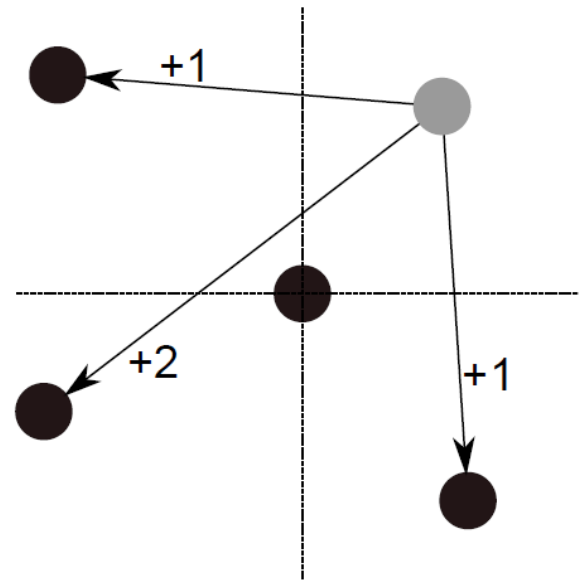
- User study
- Measurement
 - Movements
 - Arrangements (Order)



Angular Change

How to determine Stability?

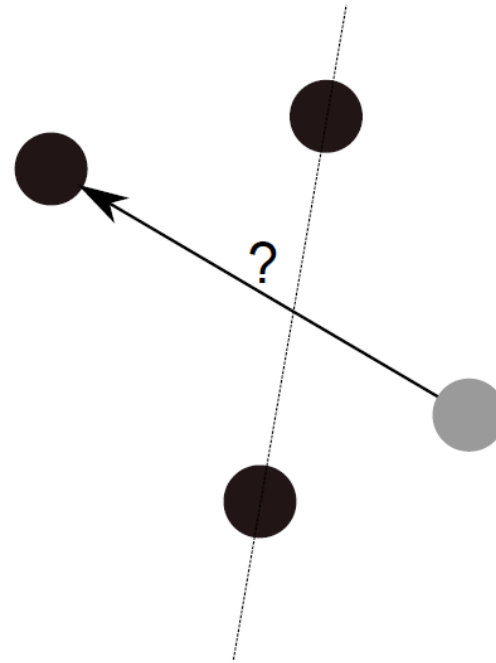
- User study
- Measurement
 - Movements
 - Arrangements (Order)



Orthogonal Order

How to determine Stability?

- User study
- Measurement
 - Movements
 - Arrangements (Order)



Lambda Matrix

How to determine Stability?

- User study
- Measurement
 - Movements
 - Arrangements (Order)
- Global vs. local stability

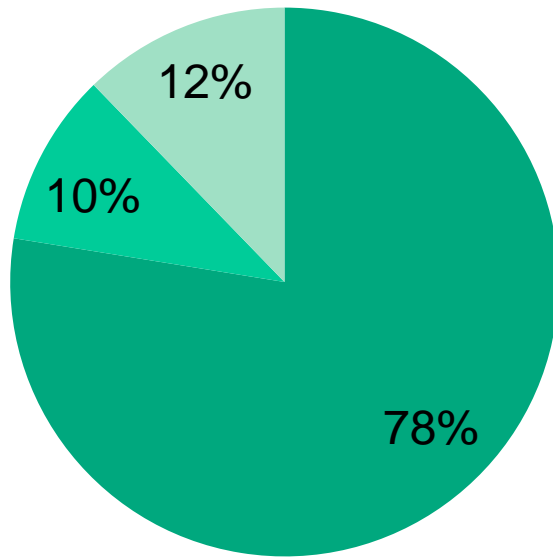
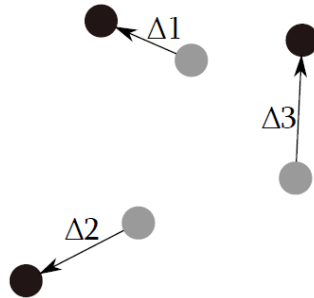
Stability Results

	# Classes	# Releases
Ant	1251	11
ArgoUML	3023	11
JHotDraw	2571	11
Jogl	484	3
JUnit	386	19

- Applied 5 metrics (global & local)

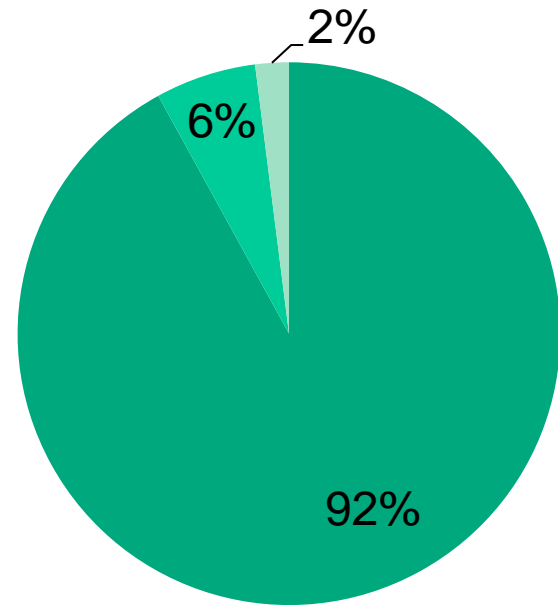
Stability Results

Metric: *Euclidean Distance*



global

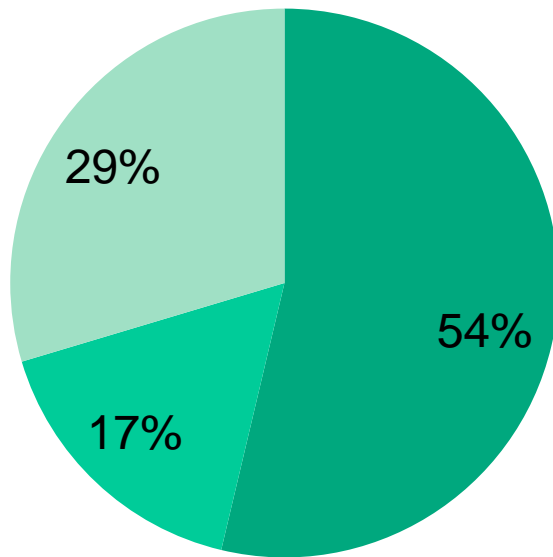
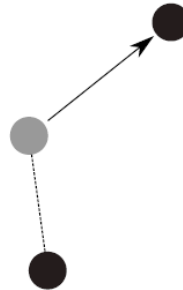
- EvoStreets
- Packing
- Relational



local

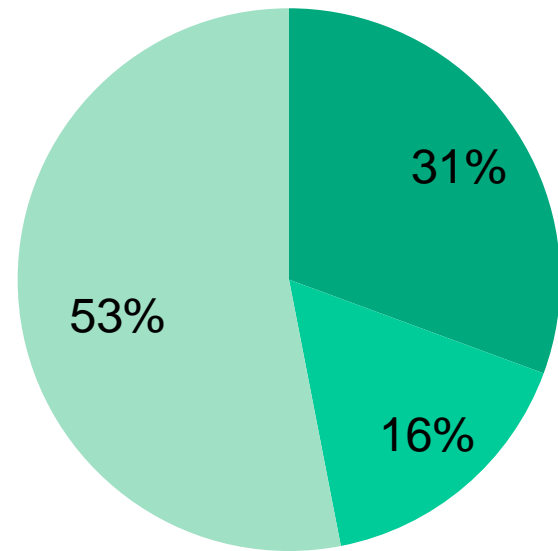
Stability Results

Metric: *Nearest Neighbour Between*



global

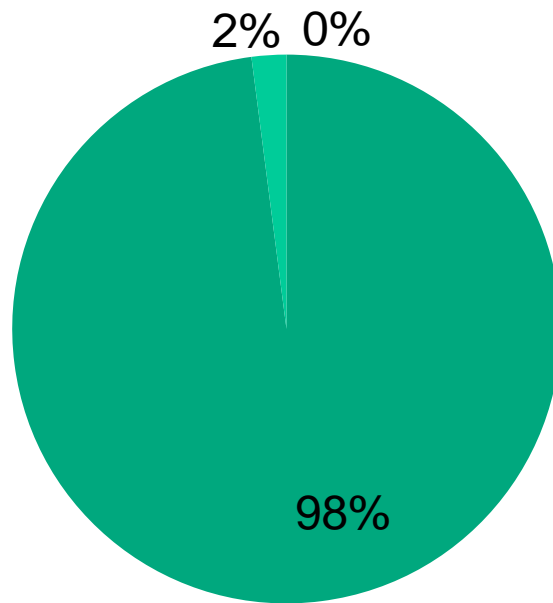
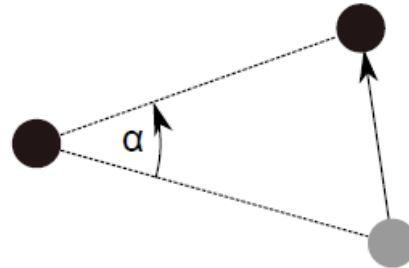
- EvoStreets
- Packing
- Relational



local

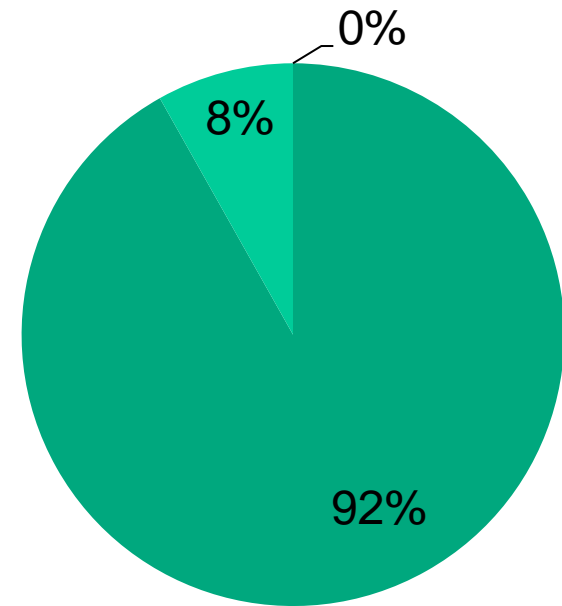
Stability Results

Metric: *Angular Change*



global

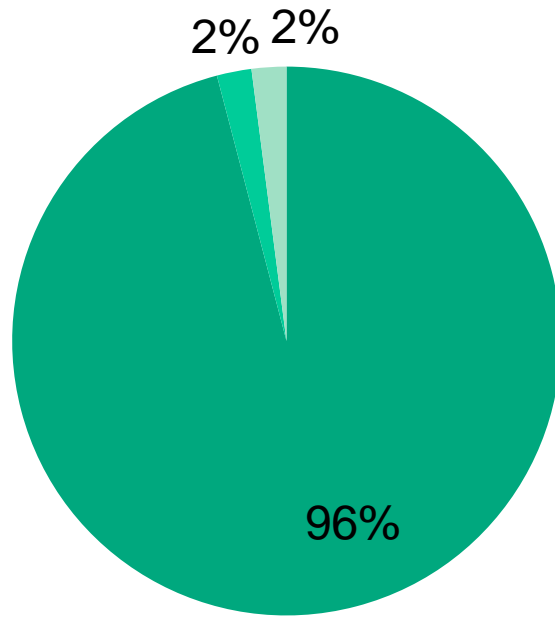
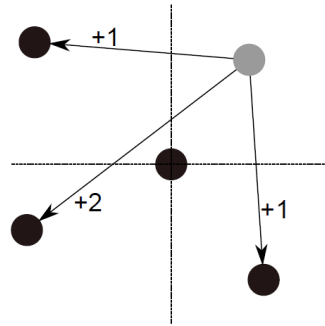
- EvoStreets
- Packing
- Relational



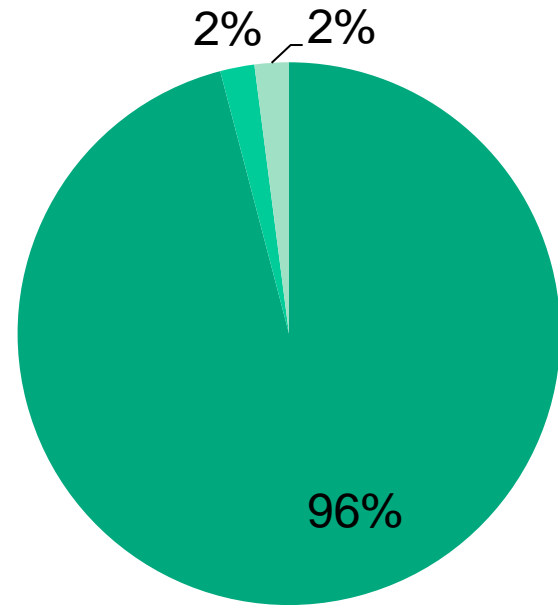
local

Stability Results

Metric: *Orthogonal Order*



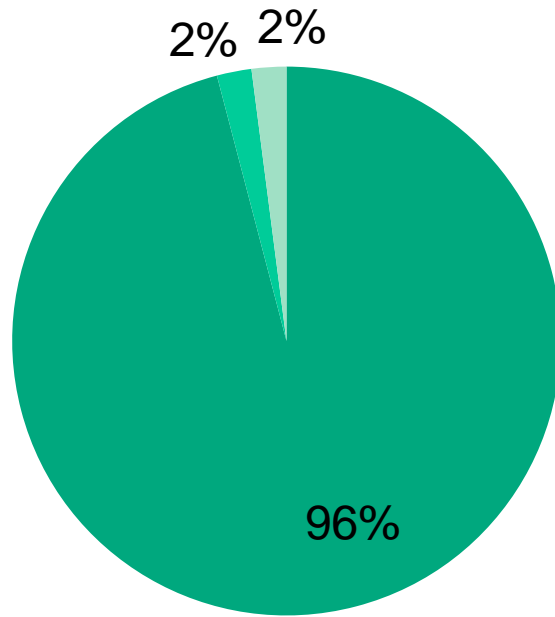
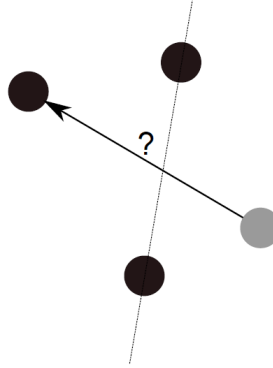
global



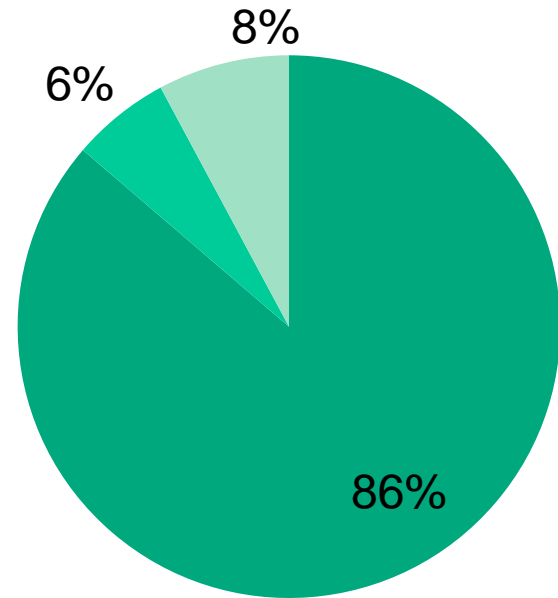
local

Stability Results

Metric: *Lambda Matrix*



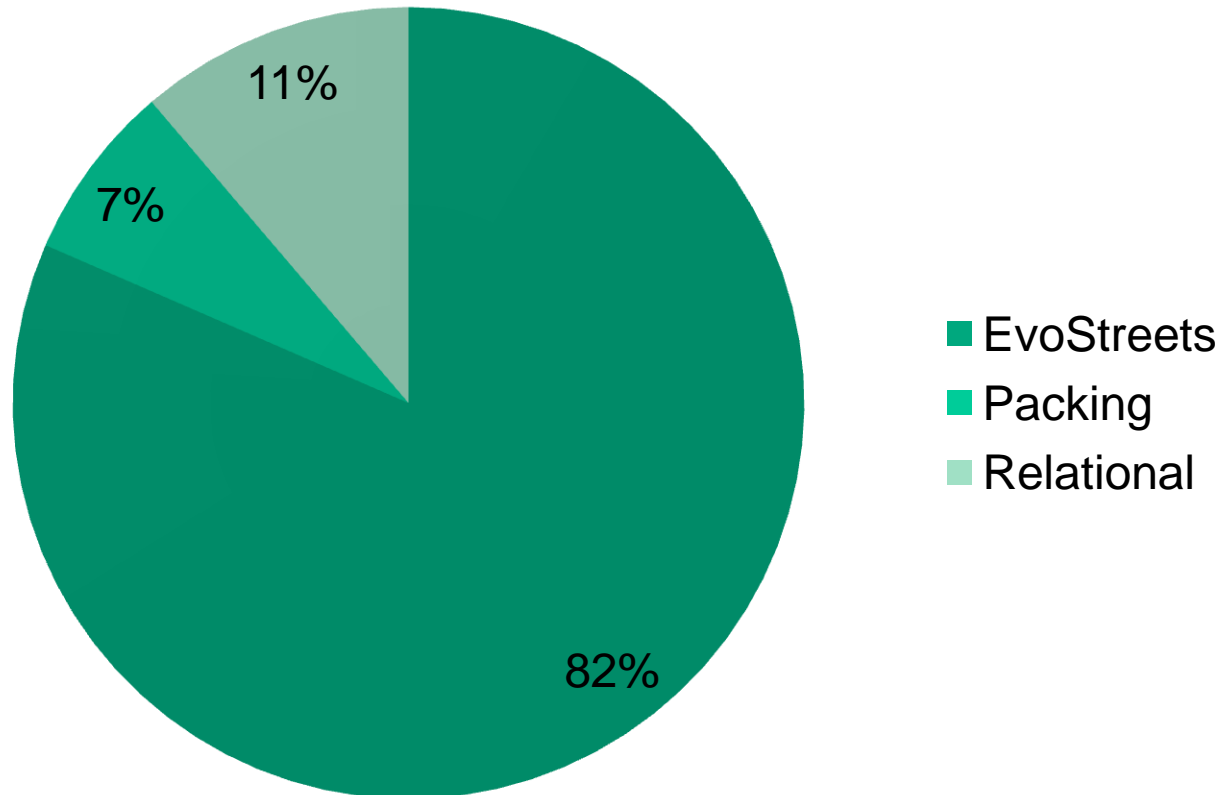
global



local

- EvoStreets
- Packing
- Relational

Stability Results



Ongoing Work

- More systems, more versions
- More stability measures (e.g. neighbourhoods)
- More layouts
 - Thematic Software Maps (A. Kuhn, O. Nierstrasz)
 - Panas et.al. ...
- More quality aspects
 - Compactness
 - Readability
 - User preference