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On the Relationship between City Mobility and Blocks Uniformity

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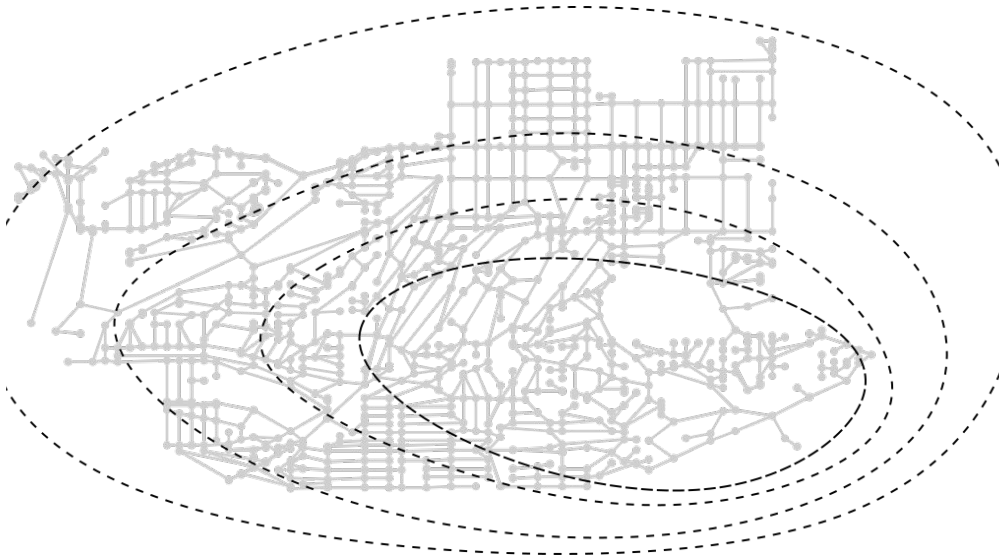
Motivation

- Cities have different physical organizations (geometry and topology);
- People need to move effectively around the city;
- Does the city physical organization influence urban mobility?

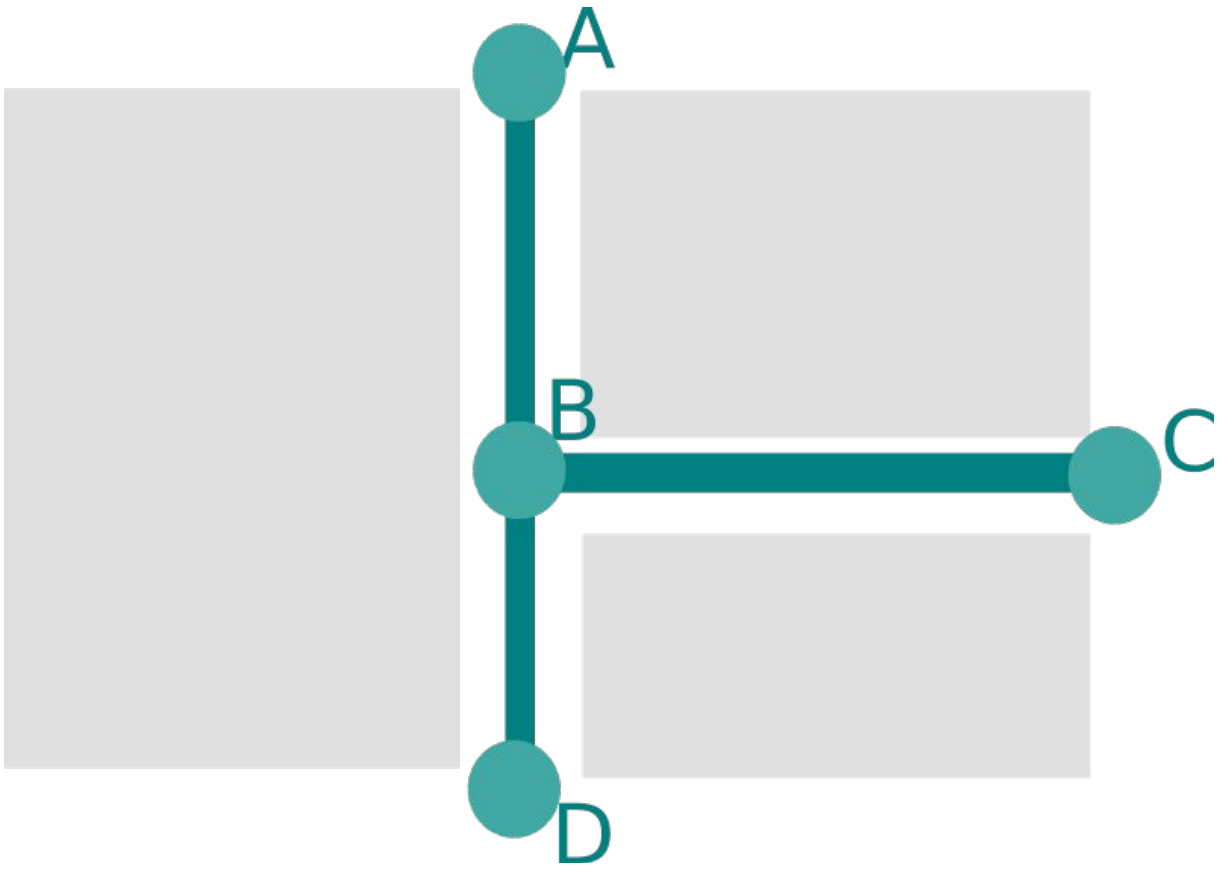


City contour lines may drastically differ from one another.

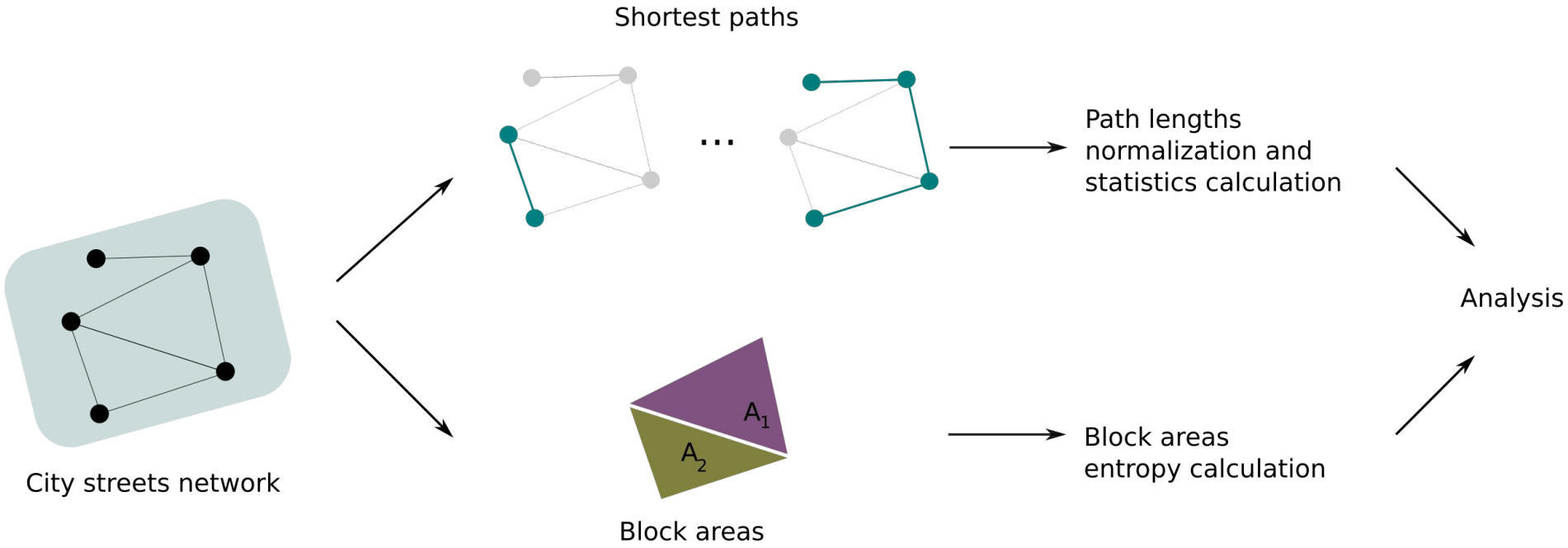
Objective

Analyze the relationship between city mobility and blocks uniformity.

Streets network



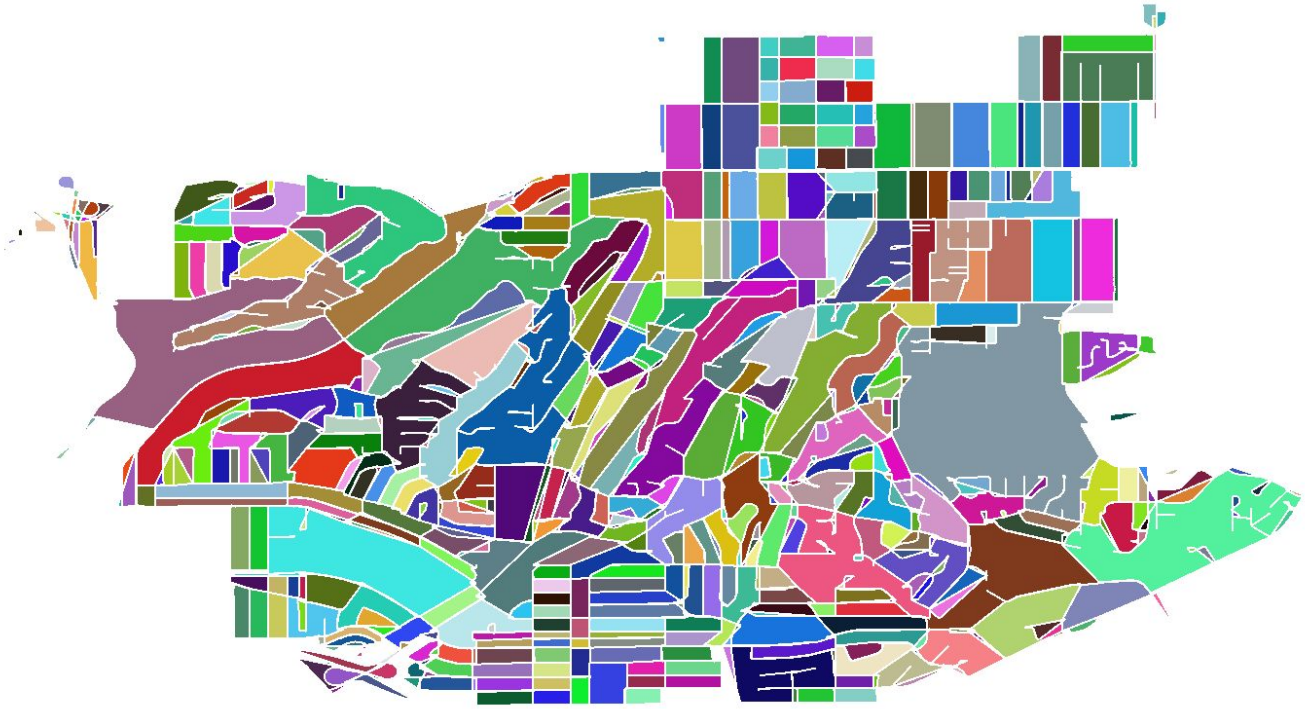
Method overview



Graph extraction

Shortest paths calculation

Blocks area calculation



Relative area

Given a region composed of n blocks, A_i is defined as the *area of the block relative to the sum of areas* and

$$\sum_1^n A_i = 1$$

Divisional entropy and Evenness

The *divisional entropy* thus is defined as:

$$E_A(A) = -\sum_{i}^{n} A_i log\ A_i$$

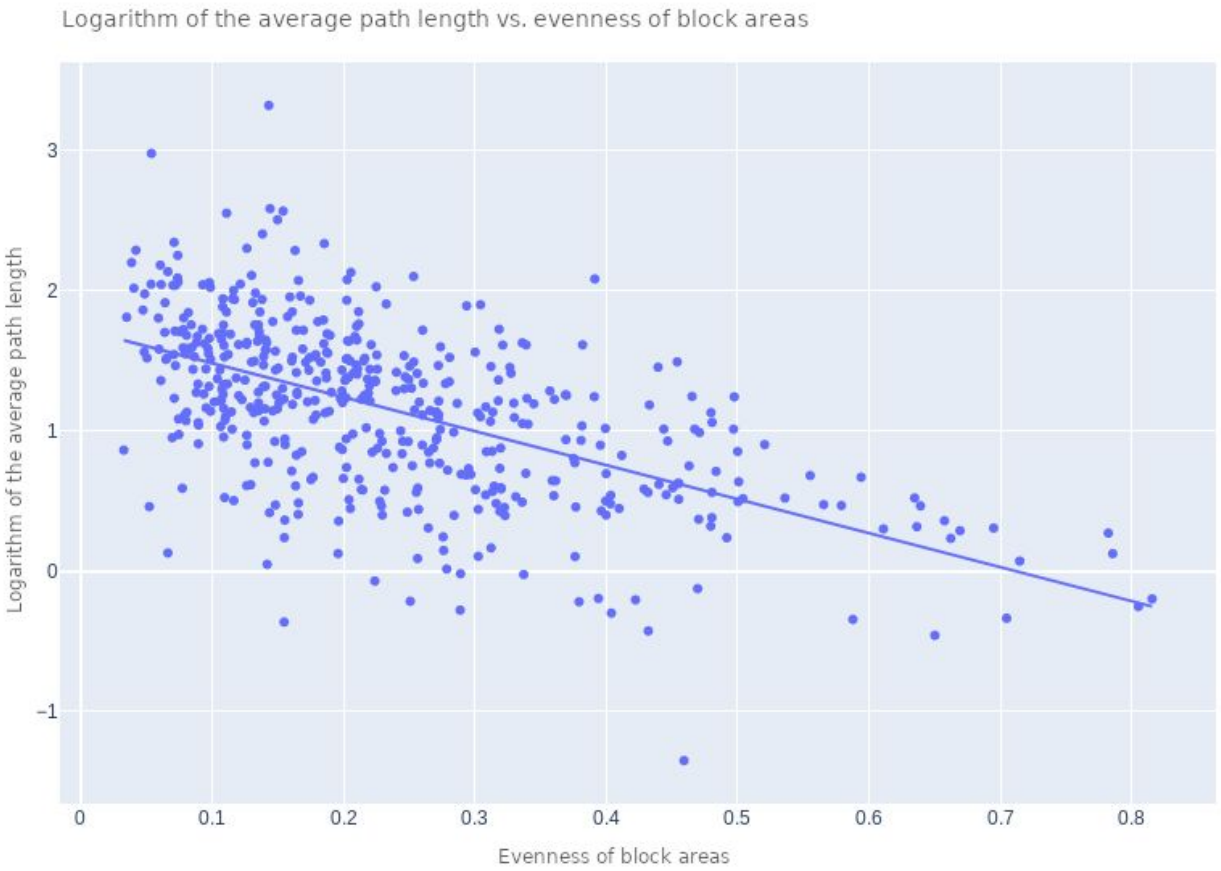
And the *evenness* is defined as the exponential of the divisional entropy.

Experiments

- **482 cities from California*, from OpenStreetMaps**
- **Shortest path calculation (Dijkstra)**
- **Block areas calculation (computer vision)**
- **Pearson's correlation coefficient**

*https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/CUWWYJ

Entropy of areas vs. mean path length



Pearson's correlation coefficient: -0.581

Entropy of areas vs. coeff. of variation of the mean path length

Pearson's correlation coefficient: -0.583

Final remarks

- *Evenness* is an effective method for analyzing city block areas uniformity;
- Block areas uniformity is negatively correlated to the average shortest path length;
- The more uniform the block sizes, the smaller the shortest paths value;
- Urban mobility is associated with blocks uniformity

Acknowledgments

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