VIS 2019

VitalVizor: A Visual Analytics System for Studying Urban Vitality

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Urban Vitality

- Urban design is about place-making [Buchanan 1988, p.33].



Urban Design Process

- Vitality is the first basic elements of good urban form [Lynch's 1981, p. 113].

Urban design is essential about improving urban vitality!

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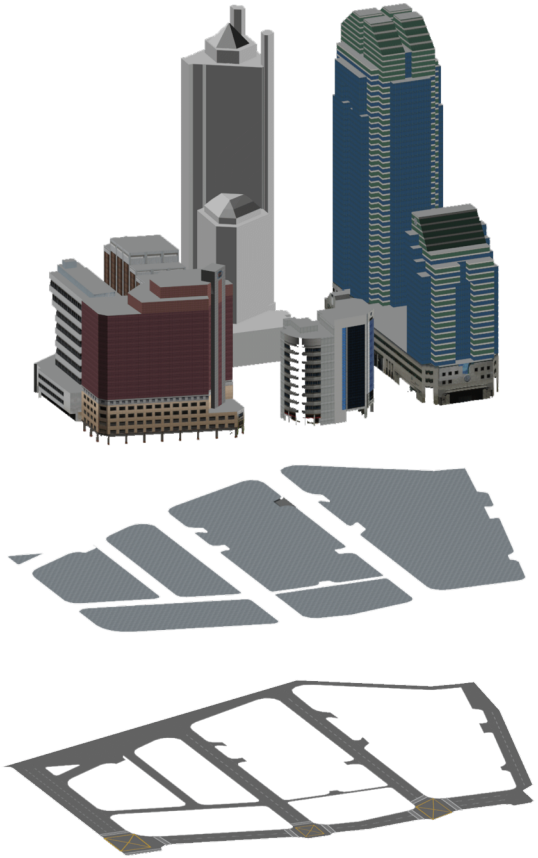
Urban Vitality

- The term 'urban vitality' is implicit and vague
  - *Diversity* [Jacobs, 1961]
  - 1) *Visual*, 2) *functional*, 3) *environmental*, and 4) *vibrant urban experiences*, or *urbanity* [Cook, 1980]
  - Urban composition not only *functions* properly but *pleasing in appearance* [Rowley, 1994]
- A gap between theory and practice
  - From qualitative descriptions to quantitative metrics
  - A visual analytics system
    - Locate which areas are vital/unvital
    - Identify what factors make the places vital/unvital

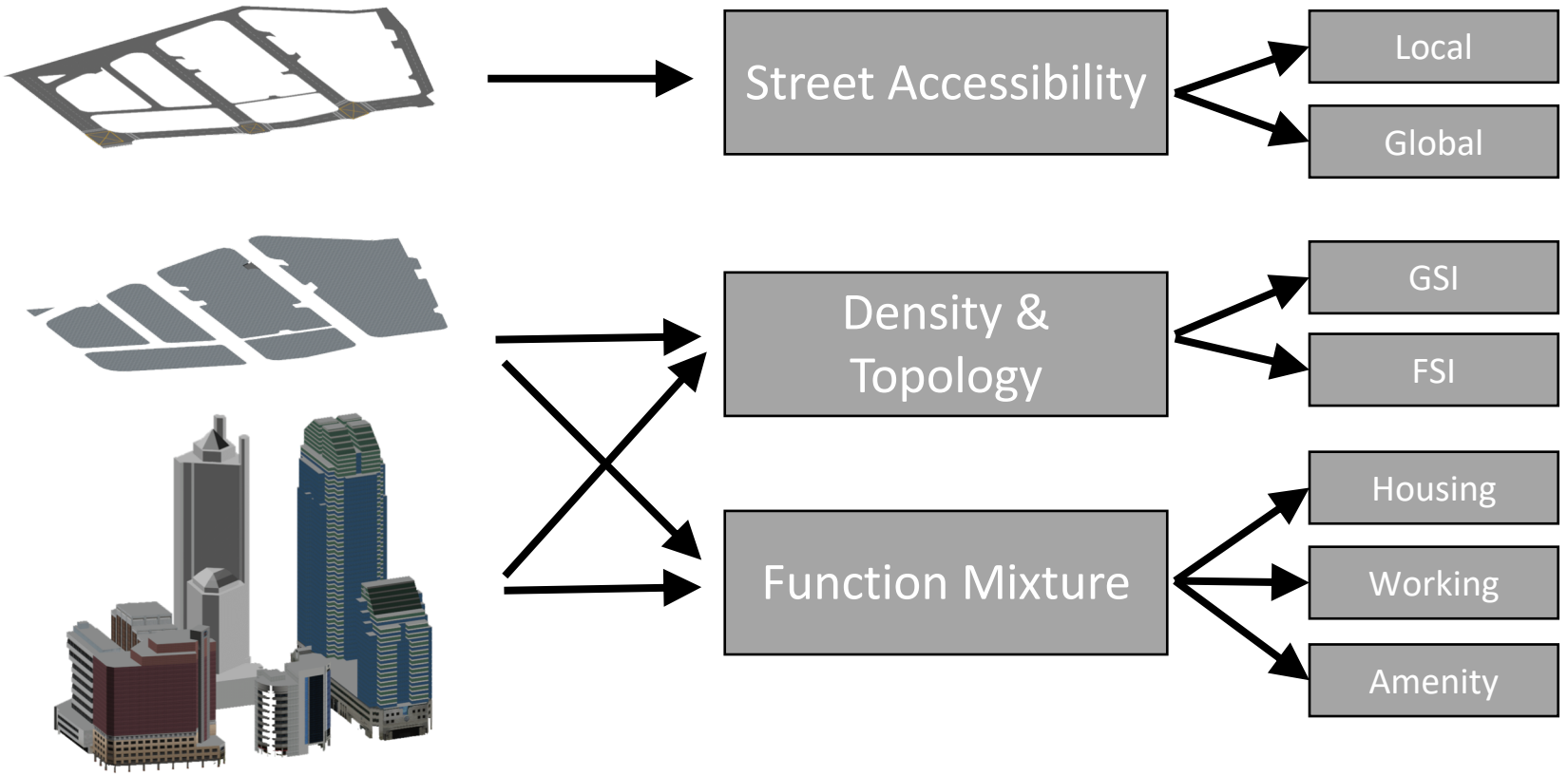
Vitality Metrics

- Quantitative metrics for ‘urban vitality’



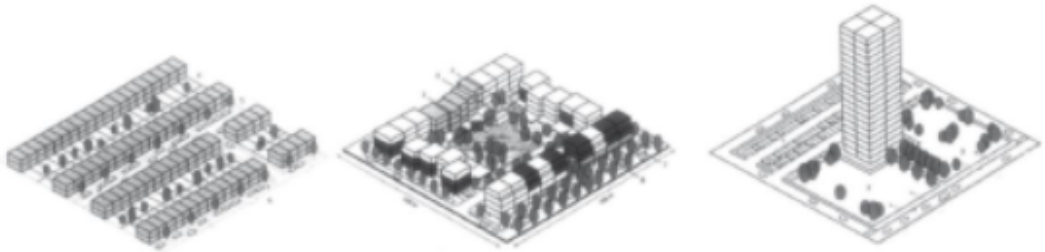
Vitality Metrics

- Quantitative metrics for 'urban vitality'



Vitality Metrics

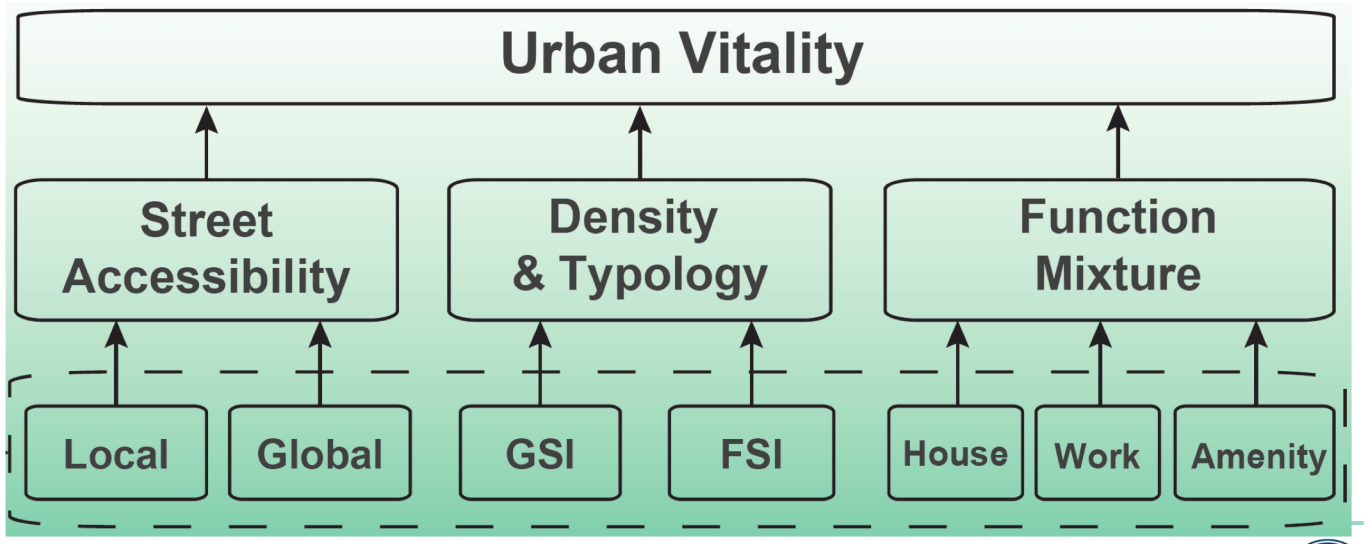
- Street accessibility (https://sdna.cardiff.ac.uk/sdna/)
  - Mean Angular Distance (MAD) $\boldsymbol{SAD}(\boldsymbol{x}) = \sum_{y \in Rx} d\theta\ (x, y)\ P(y)$
  - Betweenness centrality
- Density & topology
  - Ground space index (GSI): GSI
  - Floor space index (FSI): FSI =



- Function mixture
  - Housing, working, and amenity
  - Mono-functional, bi-functional, mixed, and highly-mixed

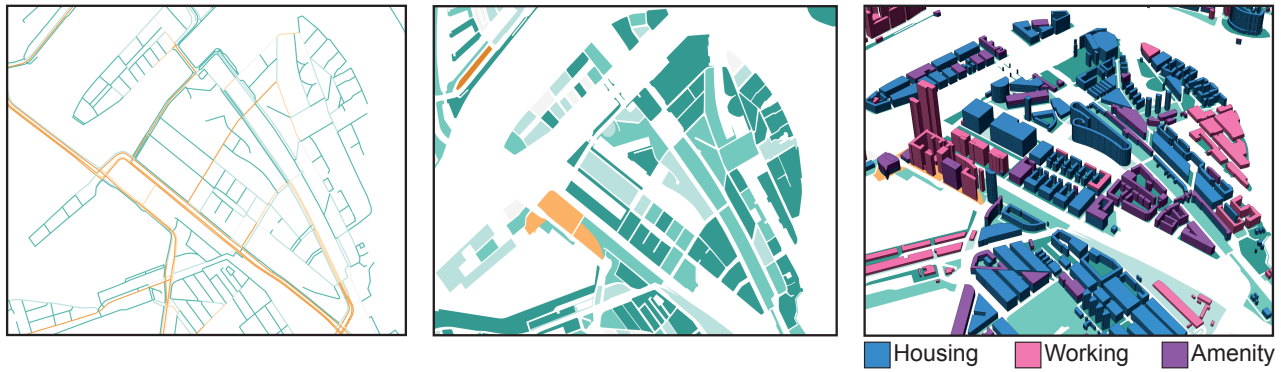
Data Characterization

- Physical entities by nature exhibit ***geospatial*** information
  - Buildings → 3D
  - Blocks → 2D, multiscale
  - Street networks → 2D, graph
- Vitality metrics are ***multi-dimensional*** and ***hierarchical***



Map View

- Design choices
  - Street network → 2D polyline
  - Blocks → 2D polygon
  - Buildings → 3D



  - Color scheme: streets and blocks

- Interaction
  - Map navigation
  - Selection by district, lasso, or rectangle

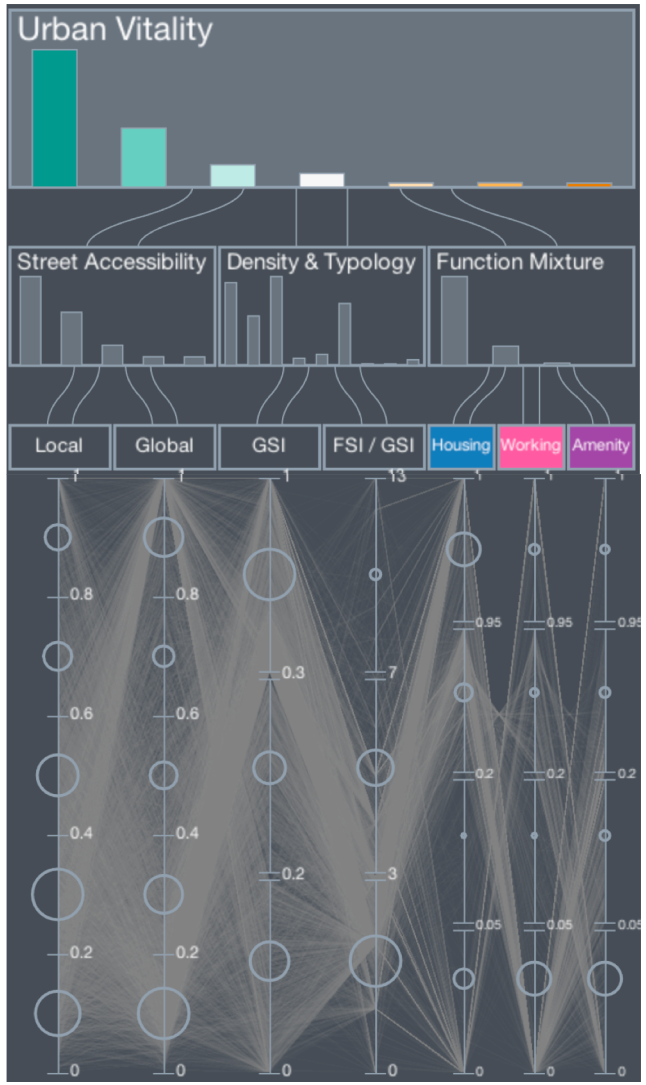
Metrics View

- Design choices
  - Hierarchical relationship

  → tree-structure diagram
  - High-dimensional information

  → PCP

- Interaction:
  - Filtering



Demonstration speaks louder than conversation!

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谢谢!

Thank You!

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