Understanding urban structures and crowd dynamics leveraging large-scale vehicle mobility data

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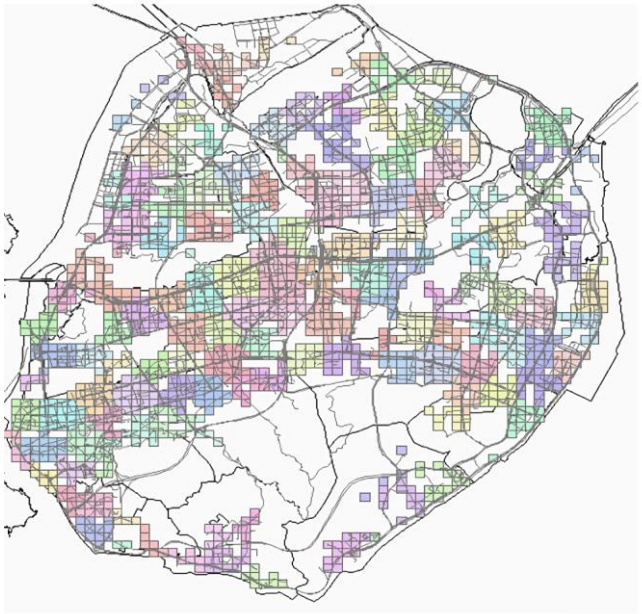
Problems & Ideas

- Problems of evaluating the impacts of urban social and emergency events, which affect the short-term event management and long-term urban planning.
  - lack of a **comprehensive** understanding of the urban structures and crowd dynamics.
  - traditional methods to understand urban structures and crowd dynamics consume **substantial time and labor**.
- Ideas: exploit large-scale vehicle mobility data extracted from city-wide taxi trajectories.
  - a distance-constrained clustering algorithm (DCCA) to **cluster the grids with similar mobility features into structured urban areas**.
  - an ARIMA-based anomaly detection algorithm(ADAM) to **detect irregular mobility traffic patterns in each area**.
  - correlate abnormal flow points to the **urban social and emergency events.**

Experimental Results

- **Results of urban structure portrait**



- **The Results of Anomalous Traffic Flow Detection**

Methods	Precision	Recall	F1-Score
ULQT	31.6%	90.7%	46.9%
S-H-ESD	80.0%	62.5%	70.2%
iForests	50.0%	58.1%	53.7%
ARIMA (Proposed)	71.8%	92.0%	**80.7%**

We evaluate our framework **using real-world datasets collected from Xiamen City, China**. Results show that our approach can **sense urban structures and crowd dynamics** for urban planning and city management **comprehensively and effectively**.