Budgeted Spatial Data Acquisition: When Coverage and Connectivity Matter

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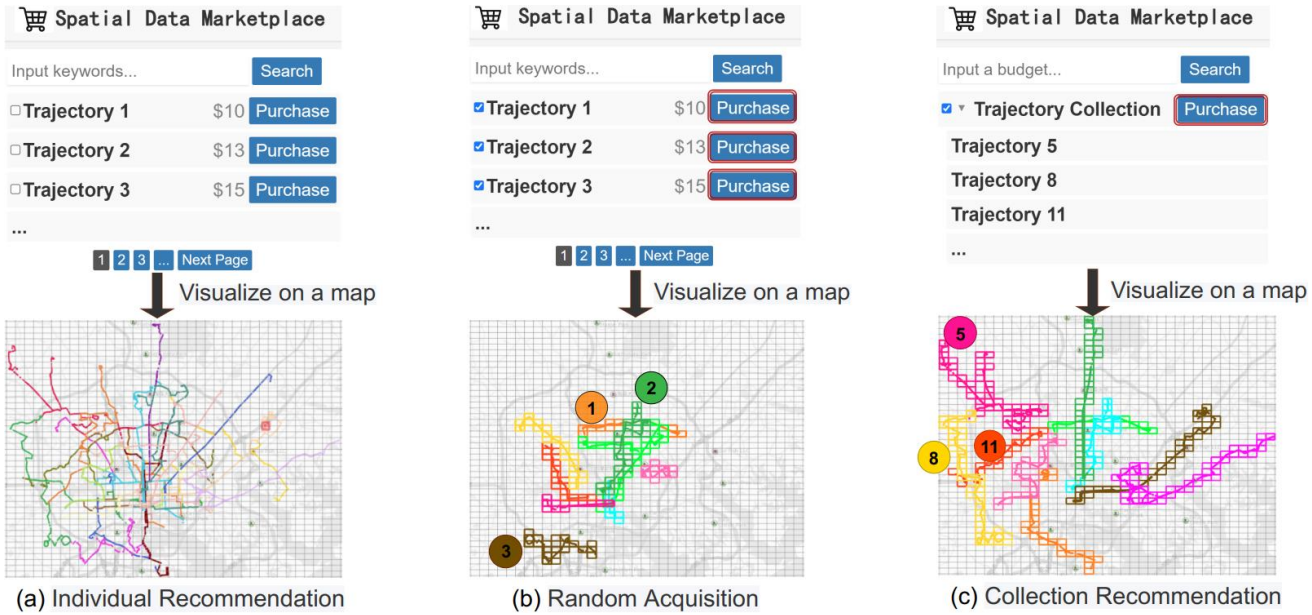
Problems & Ideas

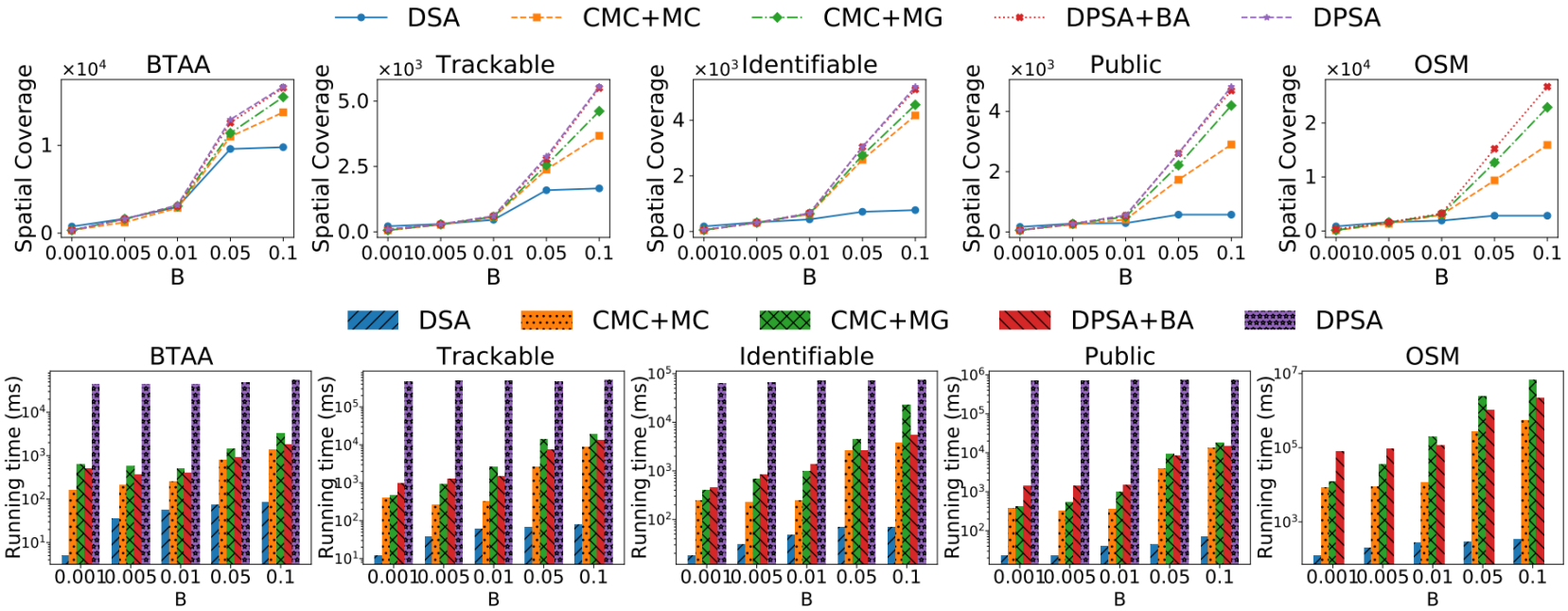
- Problem of Budgeted maximum coverage with connectivity constraint:
  - It aims to acquire a collection of datasets with the maximum spatial coverage under a limited budget while maintaining spatial connectivity.
- Ideas: The existing data marketplaces lack consideration of the case where buyers want to acquire a collection of datasets, and the overall spatial coverage and connectivity matter.



An example of dataset acquisition under a limited budget. (a) shows the individual dataset recommendation in the current marketplaces, (b) forms the collection by randomly choosing individual recommended datasets, whereas (c) directly recommends the dataset collection.

Main Contributions

- Contributions:
  - A novel approximate algorithm, the Dual-Search Algorithm (DSA), is proposed, complete with detailed theoretical guarantees and a time complexity analysis;
  - To further improve the approximation ratio for large input budgets, we introduce the Dual-Path Search Algorithm (DPSA), which also includes comprehensive theoretical guarantees and time complexity analysis, along with two acceleration strategies to enhance efficiency.



Comparison of the spatial coverage and running time with increasing budget B