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Automatic icon placement approach for improved association & walkability on city wayfinding maps

In the age of digital transformation, the art of map-making has come a long way. Gone are the days of hand-drawn maps; today, we have intricate digital maps that guide us through the bustling streets of our cities. But have you ever wondered how those little icons on the map, such as landmarks, restaurants and bus stops, are placed and why their placement is important for navigation? It is not as simple as it seems, especially in high density urban areas where every inch of space matters.

This research delves into city wayfinding maps, with a focus on icon placement. Historically, this was a time-consuming manual task. The challenge? Ensuring that the icons are placed in a way that they do not obscure background map features, do not overlap with themselves and text labels on the map, and accurately represent their real-world locations. These are the main metrics that evaluate the map's quality.

To tackle this challenge, a two-step approach was adopted. Initially, a grid search algorithm was used to place the icons in positions that caused the least disturbance on the map. Then, using a method called multi-objective optimization, these positions were optimized with respect to the three quality metrics. Finally, the optimized result that prioritized the association between icons and their real-world references, was chosen as the best one for this study.

The outcome? A set of icon positions on city wayfinding maps that are both visually appealing and user-friendly. These optimized positions align with the guidelines set by the cartographic company T-Kartor, while they respect the three metrics. More importantly, the main focus on association enhances the user's walking experience, making navigation in complex cities a breeze.

This research offers a significant contribution to the field of icon placement, which received less investigation in recent years. Of course, no research is without its challenges. Future work can look into making the process even faster, accommodating different icon shapes, and creating a plugin that allows users to customize the level of optimization they want based on their preferences.

Keywords: Physical Geography, Ecosystem Analysis, Cartography, Icon placement, High density, City wayfinding maps, Metrics, Grid algorithm, Optimization, Association, Walkability

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