

Filtering Location-Based Information Based on the Real World

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Introduction

Although mobile, ubiquitous or mixed-reality systems may exploit tracking information for context, they rarely incorporate knowledge of the geometric configuration of the space. We have augmented a tourist guide system, the George Square system, with a visibility-filtering algorithm that can use knowledge about the actual buildings in the environment to cull away information about objects that the user probably cannot see from their current location.

Boundaries and Focus Points

Physical boundaries of buildings, parks and roads can be obtained readily from OS Mastermap. In addition, when the system is initialised, it is primed with information about places of interest, referred to as Focus Points in the Recer system. The region bounding the places of interest is represented in the form of a polygon. A Recer editor has been developed such that these boundaries can be directly 'drawn' on the map during initialization phase.



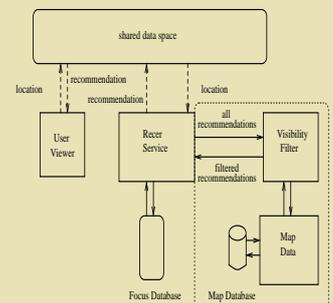
Visibility Computation

A target set of points which lie within the bounding region of a focus point is randomly selected. A viewpoint set is selected, such that the points are near the viewpoint. Rays are cast from each point in the viewpoint set to a point in the target set. If a ray does not cross any building on its path, it is considered to be a visible ray, otherwise it is an invisible ray. The percentage of visible rays for a given pair of set determines the visibility confidence of the focus point.



Visibility Filter in the Recer Service

At regular intervals, the Recer service generates recommendations to the tourist. These recommendations can be in the form of an image, place or a URL. It considers recommendations within a distance around the user. The visibility of the recommendation is computed using the previously mentioned algorithm. The user then receives recommendations of items that can be spotted from his location. Figure on the right shows the overall system architecture.



Unfiltered Recommendations

The service uses the Recer collaborative filtering algorithm that matches a user's recent activity with similar past periods on activity in the database, and drawing locations and URLs from these periods. Currently, this service is designed to recommend a set number of web pages, places and photographs from past visits. With the visibility filtering turned off, 4 buildings are recommended as shown in the figure.

Filtered Recommendations

However, from the user viewpoint, some recommended buildings may not be directly visible, as they will be obstructed by other buildings. The filtering mechanism demonstrates that indeed this is the case, and eliminates the building whose visibility certainty is less than an empirical threshold of 0.4.

