

# A Proposal of Spatial Operators for a Collaborative Map Search System

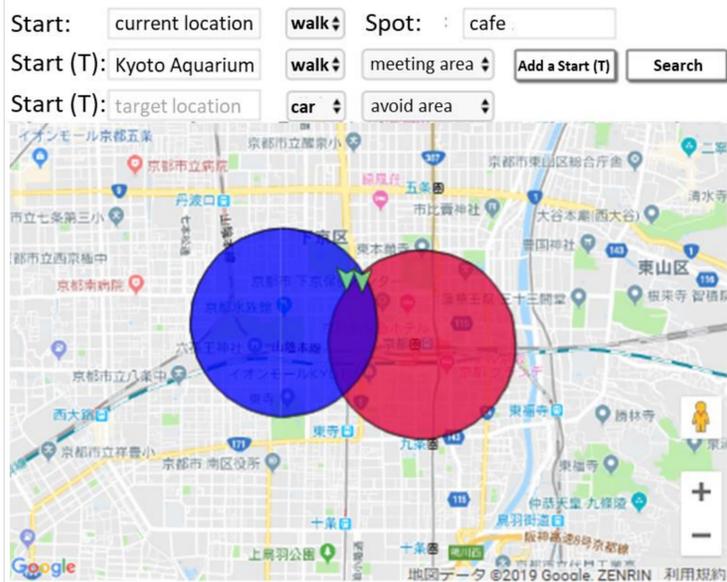
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## Overview of Proposed Map Search Applications

### “Meet Up Application”

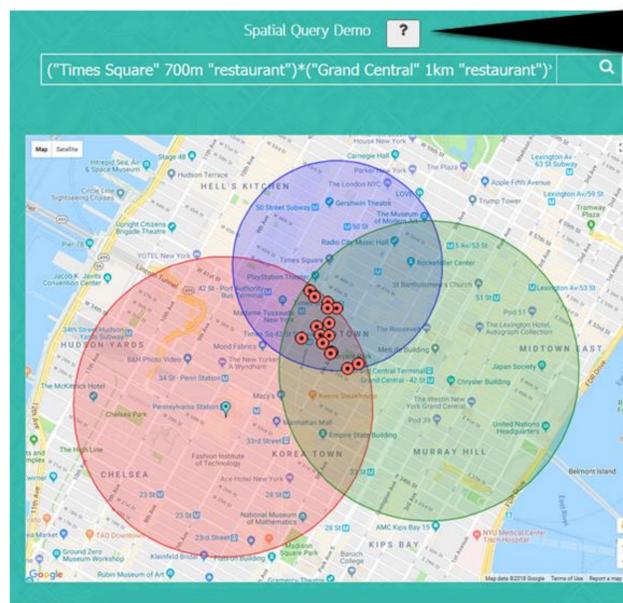
a collaborative map search system:  
<https://yklab.kyoto-su.ac.jp/~ichimura/spatialQuery/>



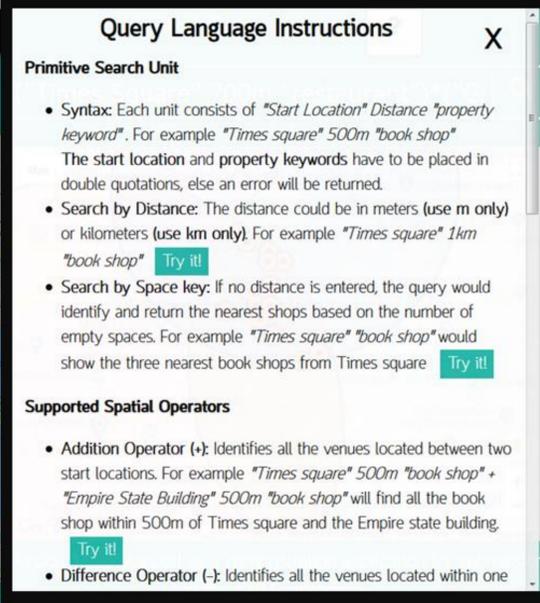
Find **cafe shops** that are equally near to all of users' start locations by **walking** (Start: **Kyoto station**, Start (T): **Kyoto Aquarium**)

### Spatial Query Search

<https://yklab.kyoto-su.ac.jp/~sakata/spatialQueryDemo/>

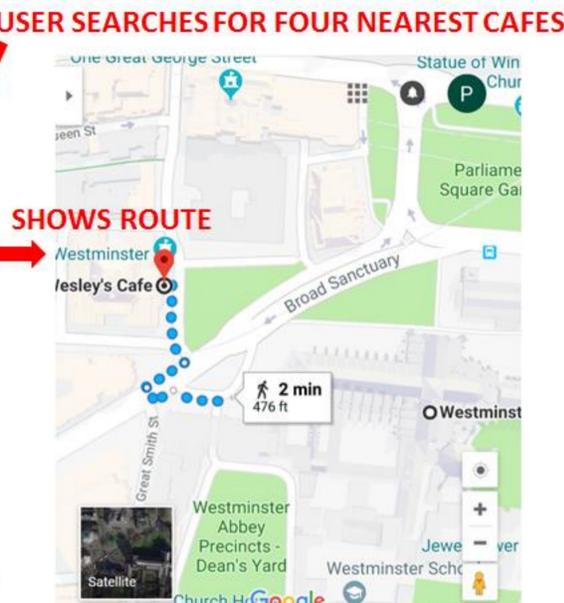
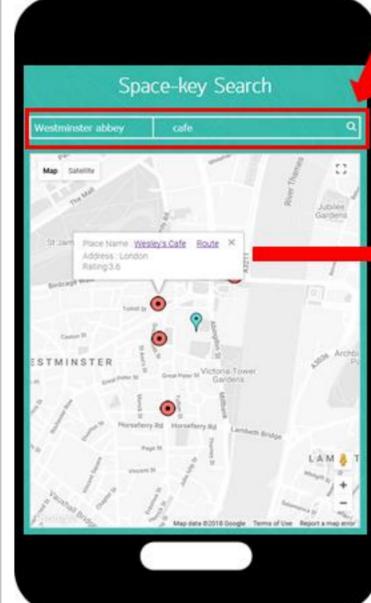


Find **restaurants** located within 700m of **Times Square** and within 1km from **Grand Central** and **Pennsylvania station**



### Space-key Search (Google Play store)

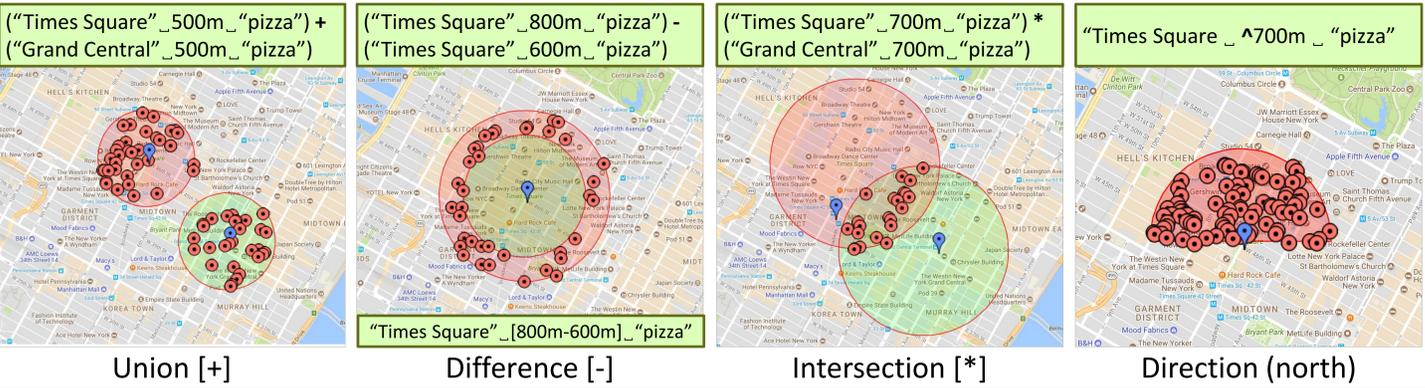
<https://yklab.kyoto-su.ac.jp/~sakata/simple/spatialQuery/>



Find 4 nearest **cafe shops** from **current location** by **walking**  
– Details of results (address, review score etc.)  
– A link of the route to the destination

## The Spatial Query Language

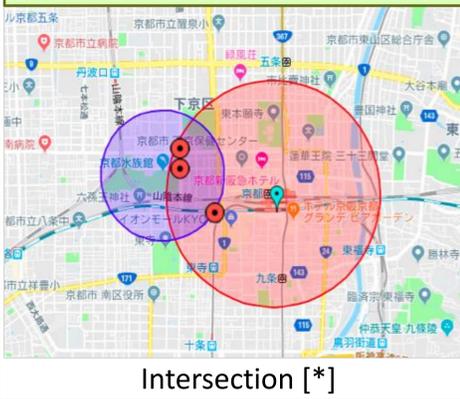
- Rule 1** The syntax of the most primitive unit of spatial queries is defined as follows: A\_distance\_α. The distance by using a unit distance (e.g., 200m) or by using continuous spaces (e.g., the N nearest α).  
Ex.) A\_800m\_α: identify the α objects which exist inside the region 800m from the origin point A  
A\_3\_α: identify the 3 nearest α objects from the origin point A
- Rule 2** The keywords (e.g., A and α) used in the primitive unit of the spatial query are encapsulated within a double quotation mark (e.g., “Tokyo tower” for A or “pizza shop” for α).
- Rule 3** Each primitive unit of the spatial query can be combined with other units through the use of spatial, directional and distance operators in a mathematical expression format.  
Ex.) (A\_800m\_α) + (B\_300m\_α)



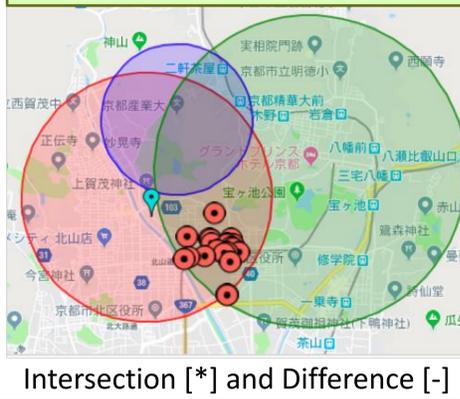
## Evaluation and Prototype

- 5 students completed 2 search tasks through proposed system and Google Maps by **SUS**
  - **Average accuracy:** proposed system (90%) > Google Maps (10%)
  - **Average satisfaction:** proposed system (3.92) > Google Maps (2.08)
- ➔ **Confirmed proposed system greatly improves both accuracy and satisfaction**

Find **convenience stores** that are within **walking distance** from **your friend's location** and **by car** from **your current location**.



Find **cafe shops** that make it is possible to **meet two people** while **avoiding one person**.



Find **cafe shops** located within **walking distance** from **your current location** but **not within range** from college by **car**.



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