Geographic relevance in mobile services

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Outline

• LBS: the shortcomings
• Geographic relevance as an extensions of GIR & LBS
• Definition & conceptualisation of geographic relevance
• The different conceptions of location & space
• Links to other papers
Mobile usage of geographic information

- **cognitive capacity / workload** -> information overload
- time & capacity for information extraction
- limitations of resources
  - **small Display** -> lack of space, & spatial overview
  - interaction possibilities
- movement
- changing usage **contexts** and user **activities**
- geo-locating (GPS, network, ...)
- digital **representation**
  - high flexibility
  - dynamic adaptation of information
Why location is not always enough

two users at the same location:
• … share the location
• … perform different activities
• … have different information needs
• … hence need different information in a representation of geographic space
Shortcoming of LBS and other mobile services

• utility of service / information often lacking
  • mismatch, overload, and irrelevance of information provided
  • lacking awareness of usage context (relevance)
  • LBS use simplistic, binary relevance concept applying buffers

• usability often unsatisfying
  • representation of information not adapted to the mobile usage situation
  • lacking consideration of cognitive abilities
Differences to GIR & LBS

• application of **different representations**:  
  • GIR: Documents / Images  
  • GeoRel: Objects, Maps

- maps  
- geo-databases  
- images  
- documents  
- sound  
- speech  
- video

• using **more contextual relations**:  
  • LBS: location, theme  
  • GeoRel: location, place, time, activity, theme, intention, goal
GeoRel Project Objectives

- extension of current LBS / GIR in the following ways:
  - shifting the location-based perspective to a **relevance-based perspective**, including the spatial, temporal, topical, and motivational dimensions.
  - considering the relation of information needs with information objects within the **mobile usage context**.
  - exploiting **geography as a unifying framework** for a broader understanding of relevance by the nexus of location (where), time (when), and objects (what), i.e. geographic relevance.
  - employing more sophisticated **spatial concepts** for filtering content than simple distance-buffer selections.
  - developing **assessment methods** for geographic relevance
  - developing **suitable representations of geographic relevance** within mobile services or applications.
Conceptual model of geographic relevance

- Geographic Relevance
  - Representation
    - properties
    - relations
    - structure
  - Thing
    - WHAT
      - object
      - subject
    - WHY
      - focus
      - topical
      - mediated
    - HOW
      - motivation
      - goal
      - condition

- Activity Theory
  - Activity
    - Social
    - Context
    - Situation
    - WHEN
      - Location
      - Time
    - WHERE
      - Place
    - Context Modelling
      - Information
      - Cognition
      - Computational environment
      - Infrastructure

- User
  - information needs:
    - performance support
    - problem solving
    - intentions
    - plans
Defining geographic relevance

- geographic relevance denotes how connected and applicable some information is to the matter at hand, expressed as context, and how properly it supports decision-making or solving a problem in that context.

- relevance of geographic information in relation to space, time, user interests, display, activities, goals, requests, etc.

- based on fundamental geographic concepts:
  - spatio–temporal distances
  - spatio–temporal constraints (e.g. accessibility within a network -> time geography)
  - geographic associations (e.g. neighbourhood relationships)
Intuitive geographic relevance

generally objects are relevant for a mobile user, if they:
- are closer (proximity, co-location)
- are accessible
- are current
- are visible / audible
- or one of their attributes are required for a successful performance of an activity or task
- have the potential as a solution to a problem
- are related or connected to existing knowledge or experiences of a user
- have a high information content
- are in the focus of attention
- are usable, functioning, open

...
Relevance of geographic objects

- spatial relevance: \( r_{\text{spa}} \)
  
  distance to position

- temporal relevance: \( r_{\text{tim}} \)
  
  distance to current time

- thematic relevance: \( r_{\text{the}} \)
  
  semantic distance; relation to category of query

- combined total relevance \( r_{\text{tot}} \)
  
  \( \Rightarrow \) may yield different results than the independent use of single relevance dimensions
Space & Place in geographic relevance

location / space:

1. location as index
2. location as place
3. location for an activity
4. association, neighbourhood
5. future locations
6. geometrical
7. topological
8. structural
9. perceptual space
10. semantical

- location as query parameter
- location as information attribute
Different conceptions of space

• conceptions of space need to be addressed at different levels:
  • *(geo)metrical* (locations, distance, direction): this conception of space is useful in determining proximities.
  • *topological* (spatial relations and associations): for assessing the relevance based on accessibility connectivity in a network, i.e. a topological conception of space is more adequate.
  • *structural* (spatial configurations/layout, patterns): certain arrangements of objects or object densities can have an influence on their relevance
  • *semantic* (e.g. places, regions; functions and qualities of places): some places are more relevant than others due to a specific meaning attached to them.
  • *perceptual* often the part of space that can be directly perceived and experienced is more relevant than more distant locations.
Different conceptions of space

- **place**
- **region** (category)

**space: semantic**
- functions, properties/qualities, hierarchies, similarity, causal relations

**space: structural**
- spatial configuration/layout/composition; patterns; densities; district, edge, path, node, landmark

**space: topological**
- topological relations, co-locations, spatial association, neighbourhood order

**space: geometrical**
- location, metrics, spatial distance, direction
Links to other papers

• Edwardes: location, space, place, region
• Ehlen et al.: relevance, spatial relevance, relevance assessment
• Svee et al.: time geography, accessibility, activity patterns
• Magnusson et al.: understanding the information needs of users for tasks in different contexts; filter data and only present what is important
• Manasseh et al.: personalisation
• Böhmer et al.: filtering LBS based on context
• Doty: granularity of spatial information
• Lee et al.: perceptual space
Questions

• Thank you – questions?