Personalizing Maps

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About the Paper

- review article on *personalization* of *maps* with focus on
  - technical requirements
  - implications for society
- published in December 2015

About the Paper

- structure
  - introduction to personalization and maps
  - summary of state of the art (academic & commercial)
  - computational challenges
  - consequences for research & society

Maps

Terms

*"medium through which we **understand, construct & navigate** our natural & built surroundings"*

*“Maps are complex **cultural and technical objects** that assemble multiple data sources, assumptions about the user, cartographic traditions and practices, and design choices.”*

Maps

Terms

- a spatial model of the world
  - always optimized for specific user groups
  - *“the same area can be represented from many alternative perspectives"*
  - still: *"often perceived as a form of objective, scientific knowledge about the world”*
- increasingly consumed interactively on the web

Personalization on the Web

- adaption of site **content** & **user interface** to each user's needs
  - indicated by task, preferences, interests
- to
  - provide content with higher relevance
  - optimize usability / reduce information overload
- implemented in all major websites → *"mass personalization"*

Personalization on the Web

- starting in 2000s, now major economic incentive on the web

- resulting in system of “surveillance capitalism”:
  1) monetize freely available services with advertisements
  2) collect data about users via surveillance techniques
  3) use data to for personalization, to increase ad revenue & provide unique features

Personalization of Maps

widespread adoption of web maps makes it possible to…

- *"generate personalized maps not only for a specific task but for a specific individual”*

- *“taking into account the individual’s experience, behavior, knowledge, and particular viewpoint"*

Personalization of Maps

- based on *explicit* or *implicit* feedback from the user

  → ***manual*** personalization

  - user can set preferences & bookmarks

  → ***automated*** personalization

  - adaption of UI & map content
  - based on implicit or explicit feedback from any data source:

    current task, interests, previously visited places, current location, time of day, activity, movement patterns, …

State of the Art

- academic research
  - feature recommendation (CoMPASS, RecoMap)
  - feature selection (MAPPER)
  - lack of big data user models
- commercial map products
  - **manual** personalization provided by all major web map services
  - **automated** personalization only provided by *Google Maps* as of writing
  - recommendations (ads) based on user profiling

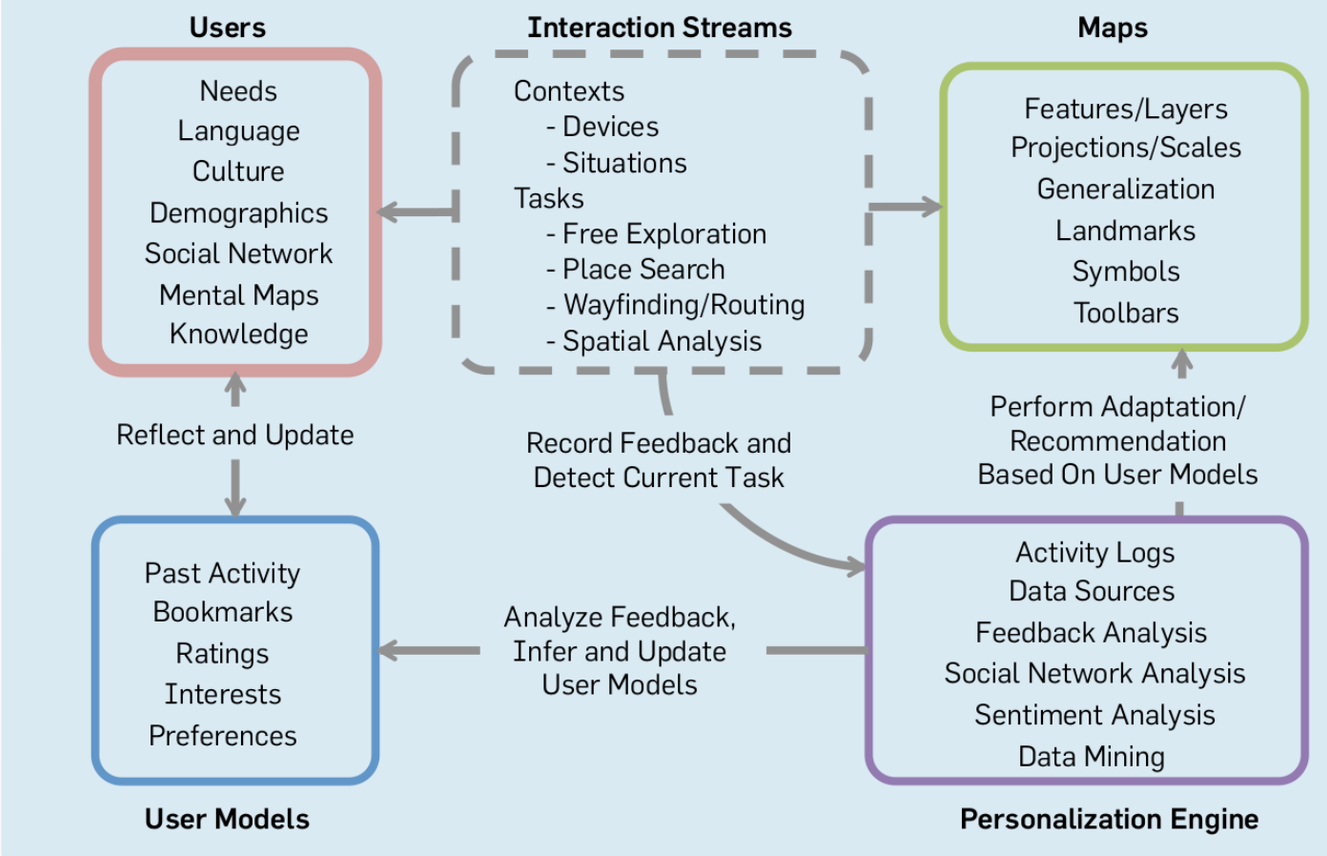
Technical Challenges

requires a “personalization engine”

- multivariate feedback analysis
- modeling preferences, context, goals of each user
- identify tasks, interests, preferences for use in personalization

→ six research areas

Figure 2. A framework for map personalization.



Technical Challenges

- real-time task detection
  - infer goals from activity patterns (in physical world, UI)
- spatial user modeling
  - predict movement patterns from recorded spatio-temporal data
  - identify anomalies
- geo-weighted personalization
  - apply spatio-temporal user model to selected places / times
- geo-semantic interoperability and data-fusion
  - infer semantics of heterogeneous data sources (map & user data)

Technical Challenges

- geo-parsing & sentiment analysis
  - extract spatial semantics, goals from natural language user queries
- cognitive map design
  - optimize map readability to current context via Spatial Cognition

→ big overlap with research areas described in *Geospatial Semantics* paper!

Implications for Society

- maps can better fit user's needs
  - reduce information overload, simplify UX
- availability to more communities
- appeal to different states of knowledge & learning types
- personalization could be implemented in reverse to promote discovery of the unknown

Implications for Society

- all required research based on big user data streams
  - no way for academics to research novel, evaluate performance of commercial products

    → extreme separation of commercial & academic research in this area

    → fostering monopolies

Implications for Society

- surveillance based tech → obvious privacy implications
- cultural impact of content filtering
  - leads to loss of common representation of space

    → creation of multiple geographic realities (“spatial filter bubbles”)

    → increasing social, cultural, spatial segregation

    → landmarks loose their shared semantics
  - lacks transparency, no off button (Google Maps)

    → no way to consciously perceive or escape filter bubble

Conclusion

- twofold goals currently implemented commercially
  - enhance UX / reduce information overload
  - maximize advertising profits

“map personalization could trigger a quiet but deep reconfiguration of familiar maps, leading to unexpected changes in the way we perceive and imagine the world around us.”

Remarks

- well written, multi-faceted view on the topic
- paper seems to become outdated, after < 3 years!

Remarks

- assessment of consequences focused on state of the art
- when extrapolating further, my conclusion would be more negative
  - recommendation algorithms create segregation by design, currently have massive impact on society
    - manipulation of perception of our world is more fundamental
  - wrong incentives (profits, not user benefit)
  - there won't be trust in maps as *"factual representations"* anymore

Thanks!

Questions?