Incremental Personalized Trip Planning

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Introduction

- **Motivation**
  - Increasing popularity of Recommender Systems
  - Complexity of trip planning process
  - Pre-defined travel packages do not meet the explorative experience of trip planning
  - Current systems do not support the tourist’s dynamically changing preferences

- **Topic of the Thesis**
  - Design of an interactive trip planning system
  - Efficient combination of human interaction and system intelligence
  - Explore travelers‘ behavior in their trip planning
Overview

• Related Work

• Tourists‘ Requirements

• SARA: Stepwise Advanced Route Advisor

• System Implementation

• User Study

• Outlook
Related Work

- On-Tour Guides with Mobile Devices
  - Information is provided based on the user's current location
  - Examples: Cyberguide [Abowd, 1997], GUIDE [Cheverst, 2000], MyMap [Carolis, 2007]

- Pre-Visit Trip Planning Systems
  - Generation of textual-based trip plans
    - A) Manual trip plan generation
      - Examples: Yahoo! Travel [2009], LonelyPlanet [2009], Realtravel [2009]
    - B) Automatic trip plan generation
Elicitation of the Users‘ Requirements

- Primary Studies
  - Expert interview with a travel agent
  - Online survey with 100 participants

- Design Guidelines
  - Combination of human interaction and system intelligence
  - Considering multiple constraints
  - Dynamic behavior of tourists‘ preferences
  - Decomposition of the planning process
  - Importance of system transparency
  - Provide an enjoyable planning experience
• SARA (Stepwise Advanced Route Advisor)
  - Construction of an executable tour plan for the city to visit
  - Concept of incremental trip planning

• Features of SARA
  - Dynamic user preferences
  - Considering multiple constraints
    (opening times, user preferences, distance and popularity)
  - Representation of trip plan via route and calendar

• Demo Video
System Implementation

- System Architecture
  - MySQL DB: stores data from different sources
  - Sources: Yahoo! Travel, Google Maps
  - Data: Opening Times, Popularity, Distances,...

- Recommendation Algorithm
  - Computation of recommendation scores for all sights available

\[
\text{recommendationScore}(\text{sight}_i) = \text{popularityWeight} \cdot \frac{\text{sight}_i, \text{popularity}}{\text{maximumPopularity}} + (100 - \text{popularityWeight}) \cdot \left(1 - \frac{\text{sight}_i, \text{distance}}{\text{maximumDistance}}\right)
\]
Three System Modes

- No recommendations mode
  - System makes no explicit recommendations for next sight
  - User constructs trip plan manually

- Local recommendations mode
  - System makes recommendations for next sight
  - User makes final decision of each sight to be included in the plan

- Global recommendations mode
  - System generates the whole plan automatically (based on a greedy algorithm)
  - User can then make adjustments of this plan
• **Goals**
  - Evaluate the overall impression of SARA
  - Investigate the appropriate degree of automation

• **Design**
  - Repeated measures within participants factorial design
  - Task: Generate a two-days trip plan in the city of Munich with each system mode

• **Participants**
  - 21 participants (10 male, 11 female), average age: 24 (mostly students)
  - Trip planning experience: 3.19, Munich experience: 3.67
• Visualization components
  • Advantage of single user interface
  • Usefulness of map view, calendar view, route and sight visualization

• Dynamic Preferences
  • Usefulness of sight preferences to control indirect recommendations
  • Usefulness of route preferences to control explicit recommendations

• Overall feedback
  • Enjoyment of explorative experience
  • Value of own decision-making
  • Transparency of recommendations
Comparison of System Modes

- **Usage Experience**
  - Especially less enjoyment and feeling in control in global mode

- **Time Efficiency**
  - Quantitative: no (8:08), global (8:35), local (8:47)
  - Qualitative: local (4.43), no (4.19), global (3.48)

- **Trip Plan Quality**
  - Quantitative: no (0.881), local (0.871), global (0.865)
  - Qualitative: no (3.95), local (3.90), global (3.86)

\[
\text{tripPlanQuality}(\text{tripPlan}) = \frac{\text{sightQuality}(\text{tripPlan}) + \text{routeQuality}(\text{tripPlan})}{2}
\]
• Gender Difference
  • Global: preferred by male participants
  • No: preferred by female participants
  → Females like to be in control over the trip planning process

• Trip Planning Experience Difference
  • Global: preferred by less experienced
  • No: preferred by more experienced
  → More experienced trip planners like to be in control over the trip planning process
• Summary
  • Incremental trip planning seems to be appealing
  • Explorative experience, dynamic user preferences and quick overview on information space need to be supported

• Future Work
  • Investigate the usability and learnability of SARA
  • Explore trip planning patterns
  • Enlarge the system for other cities
  • Add additional features (more flexibility, search function, other activities)
  • Integration of a learning algorithm
Thank you for your attention!
Trip Plan Quality

- Formula
  - Route Quality
    \[
    \text{routeQuality(tripPlan)} = \frac{\sum_{i=1}^{n} \text{sight}_i \cdot \text{duration}}{\sum_{i=1}^{n} \text{sight}_i \cdot \text{duration} + \sum_{i=1}^{n-1} \text{duration(sight}_i, \text{sight}_{i+1})}
    \]
  - Sight Quality
    \[
    \text{sightQuality(tripPlan)} = \cos(\alpha) = \frac{\text{\textbf{V}_u} \circ \text{\textbf{V}_t}}{||\text{\textbf{V}_u}|| \cdot ||\text{\textbf{V}_t}||}
    \]

- Example (Sight Quality)
  - Sight preferences: 80%, 20%, 100% \(\rightarrow\) \(\text{V}_u = (40\%, \ 10\%, \ 50\%)\)
  - Sights included: 3, 3, 6 \(\rightarrow\) \(\text{V}_t = (25\%, \ 25\%, \ 50\%)\)
  - Sight Quality: 0.945
Trip Plan Quality - qualitative

- no recommendations
- local recommendations
- global recommendations

Scores range from 1 to 5.
Differences in Mode Preference

Incremental Personalized Trip Planning System

Feeling in Control

Enjoyment

Feeling in Control

Ease of Use