Personalized Restaurant Menu

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Master’s thesis
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Supervisor: Professor Dr. A. Krüger
Outline

• Motivation
• Digital Restaurant Menu
• Recommender Systems
• Related Work
• My Thesis
Motivation
Digital Restaurant Menu
Presentation advantage

• Include more information about
  – ingredients and their origin
  – the preparation
  – the restaurant
  – ...

• Multilingual

• Comments from staff or other guests

• Multimedia data
Digital Restaurant Menu

Personalization

• Design and content

• Recommendation
  – Dish and beverage
  – Course menu
  – Information

• Personal information necessary
  – User model

• Who is with the guest?
  – Social component in recommendation?
  – Group recommendation
Digital Restaurant Menu

How to display?
Recommender Systems

• Relatively new research area
  – Mid-1990s

• Goal: Reduce choice overload

• Popular nowadays
Recommender Systems
Strategies

- Collaborative-based
  - Compute correlation between users

- Content-based
  - Compare preferences with item descriptions

- Critique-based
  - Let the user criticize the recommendation

- Knowledge-based
  - Use a knowledge structure to derive user needs

- Hybrid-based
  - A combination of two or more approaches
Recommender Systems

Important points

• Cold start problem

• Context-sensitivity

• Various requirements
  – Scrutability, diversity, novelty, ...

• Special flavors in mobile environments
  – How to display the recommendation?
  – How to cope with limited CPU/RAM?
  – How to cope with battery life?
Related Work

Digital Restaurant Menus
Commercial

Digital Restaurant Menus
Scientific

Recommender Strategy
Related Work
Digital Restaurant Menus – Commercial

Direct ordering and/or more information
Usability

Preliminary study and/or evaluation?
No recommendation for dishes
Related Work
Digital Restaurant Menus – Scientific

• Mobile approaches
  – University of Sydney – Prof. Dr. Judy Kay
    “Enhancing Restaurant Menus Through Personalised Meal Recommendations” by James Wallbank
  – RWTH Aachen – Prof. Dr. Jan Borchers
    “Pad Displays in the Restaurant” by Julian Meichsner

• Table top approaches
  – XXtraLab Design Co. – Ting-Han Chen
    “The Design and Implementation of an Interactive Restaurant Tabletop Menu” – Mojo iCuisine
  – FH Furtwangen – Prof. Dr. Wolfgang Maass
    “Development and evaluation of group support systems in non-business environments on tabletop interfaces” - Good Choice Table
## Related Work

### Digital Restaurant Menus – Scientific

<table>
<thead>
<tr>
<th></th>
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<td><strong>Recommendation</strong></td>
<td>Yes</td>
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<td>No</td>
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<td>Content, Critique</td>
<td>Predefined</td>
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<tr>
<td><strong>Preliminary survey</strong></td>
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<td>Yes</td>
<td>Owner’s needs</td>
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<tr>
<td><strong>Direct order</strong></td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Partially</td>
</tr>
<tr>
<td><strong>Group focus</strong></td>
<td>No</td>
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11/17/2011
Related Work

Recommender Strategy

• FindMe-System
  – Spontaneous decisions

• Core Idea: Assisted-Browsing
  – “Guide rather than propose”
  – Critique-based

• Dialogue between system and user
  – Gradually refining the goal

• Entree
  – Restaurant Finder

The FindMe Approach to Assisted Browsing (Burke et al., 1997)
Related Work

Entree

The FindMe Approach to Assisted Browsing (Burke et al., 1997)
My Thesis
Tasks

1. Understanding people
2. Creation of a prototype
3. Evaluation
Investigate...
... what guides guests in their decision process
... whether social influence plays a role
... what additional information is meaningful
... which expectations exist for a digital menu

Methods
- Online questionnaire for guests
- Interview of restaurant manager
- Interview of waitresses/waiters
Understanding people

First results

- 202 participants

I'm satisfied with the printed menu as it is.

- Strongly disagree: 2%
- Disagree: 13%
- Agree: 52%
- Strongly agree: 33%
• 202 participants

I think a digital restaurant menu would be a reasonable innovation.

- Yes: 66%
- No: 34%
Understanding people

First results

Age distribution of participants

<table>
<thead>
<tr>
<th>Age group</th>
<th># of participants</th>
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<tr>
<td>&lt;21</td>
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<td>21-30</td>
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<tr>
<td>51-60</td>
<td>12</td>
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<tr>
<td>61-70</td>
<td>3</td>
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Understanding people
First results

• 56 participants older than 30

I think a digital restaurant menu would be a reasonable innovation.

43% Yes  57% No
Creation of a prototype

Component overview

3 Components

- Server does the calculations (restaurant-owned)
- Tablets as main displays (restaurant-owned)
- Smartphone stores the user model (guest-owned)

Communication between the components
Central point
- Stores the restaurant menu data
- Stores the additional information
- Server/client architecture

Changes must be made only once

Recommendation algorithm runs here
- Which dishes and beverages should a user take?
- Which information to display?
- What could be good for a group?

Strategy: Content + critique (→ Wallbank, 2011)
2

Creation of a prototype

Tablet

• GalaxyTab with Android OS
  – Bigger screen size than smartphone

• Displays the digital menu
  – Personalized
  – Additional information (survey)
  – Awareness of other tablets at the table (survey)

• Assisted browsing like Entree
Creation of a prototype
Smartphone (optional)

- Application
  - Creation of an initial user model
  - Adaptation of the user model
  - Rating options

- User model reusability
  - One model, many restaurants

- Android prototype application
  - But flexible communication protocol
3 Evaluation

• Overall usability test

• Which user interface works the best?
  (c.f. Chen and Pu, 2011)

• Digital vs. conventional menu
## Digital Restaurant Menu Comparison

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*Work in progress*
Summary

Motivation

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Tasks

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Creation of a prototype
Component overview

2 Components

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- Tablets as main displays (restaurant-owned)
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Communication between the components
Thanks for your attention.
Do you want to help me?

Participate!

http://survey.info-sb.de

http://umfrage.info-sb.de
References (1/2)


Pad Displays in the Restaurant (Working Title, to appear), Julian Meichsner, RWTH Aachen, personal communication

Enhancing Restaurant Menus Through Personalised Meal Recommendations (to appear), James Wallbank, University of Sydney,
References (2/2)

Mojo iCuisine: The Design and Implementation of an Interactive Restaurant Tabletop Menu, Ting-Han Chen et al., In Proceedings of HCI (3)'2011, pp.185-194


Users' Eye Gaze Pattern in Organization-based Recommender Interfaces (2011), Li Chen and Pearl Pu, In Proceedings of the 16th international conference on Intelligent user interfaces (IUI '11)

Appendix
Related Work
User Interface Design

• Recommending laptops on website
  – Eye-tracking
  – 3 layouts

• 18 Subjects
  – 50% were interested in buying a laptop before
  – No one was certain of a specific laptop
  – Task: “Find a product that you would purchase if given the opportunity”
    • Quit if you don’t find a suitable laptop.
Related Work

User Interface Design

The top candidate

The category titles, e.g., the first one is “Lighter Weight and Bigger Hard Drive Capacity, but More Expensive Price and Smaller Display Size”

Products recommended within the category
Related Work
User Interface Design

Users’ Eye Gaze Pattern in Organization-based Recommender Interface (Chen and Pu, 2011)
Related Work

User Interface Design

• Results – Fixation duration on AOI

• LIST as expected
• Better distribution for ORG1 and ORG2
Related Work
User Interface Design

• Results – Fixation duration on product

• Amount of inspected products
• ORG2 performs best

Eye-Tracking Study of User Behavior in Recommender Interfaces (Chen and Pu, 2010)
Results – Decision quality

- Significant more people in ORG1/ORG2 choose a product vs. only 50% in LIST

- Additionally, more products in basket in ORG1 and ORG2

Interface important for recommendation