Bachelor Thesis Defense:

Conversational Information Retrieval For Instructional Content

A Modeling Framework and an Implementation for Recipe Search

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Motivation

"Sorry, I don’t know about that."

-- Alexa
Motivation
Research Questions

1. How to present results using audio?
2. How should a new information seeking model look like?
Contribution

1. Conversational information retrieval model
   
   RQ1: How to present results using audio?
   RQ2: How should a new information seeking model look like?

2. Prototype of conversational recipe search
Screen-based search

Document Retrieval

Result Interaction
## Conversational Information Retrieval Model

<table>
<thead>
<tr>
<th>Intent Classes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Original Question</td>
<td>Potential Answer</td>
</tr>
<tr>
<td>Information Request</td>
<td>Negative Feedback</td>
</tr>
<tr>
<td>Further Details</td>
<td>Positive Feedback</td>
</tr>
<tr>
<td>Intent Correction</td>
<td>Navigating Directive</td>
</tr>
</tbody>
</table>
Conversational Search Model

Search Query Formulation
- Original Question

Search Query Refinement
- Information Request
- Further Details
- Intent Correction
- Negative Feedback

Search Result Exploration
- Potential Answer
- Negative Feedback

Search Result Confirmation
- Information Request
- Further Details
- Positive Feedback

User
Agent
Conversational Search Model

Search Query Formulation

Search Query Refinement

Search Result Exploration

Search Result Confirmation

Original Question

Information Request

Further Details

Potential Answer

Information Request

Positive Feedback

Intent Correction

Negative Feedback

Negative Feedback

Further Details

User

Agent
Conversational Search Model

Search Query Formulation

Search Query Refinement

Search Result Exploration

Search Result Confirmation

Original Question

Information Request

Further Details

Potential Answer

Information Request

Positive Feedback

Intent Correction

Negative Feedback

Negative Feedback

Further Details

Potential Answer

Further Details

Information Request

Positive Feedback

User

Agent
Conversational Result Interaction Model

Required information under the threshold of cognitive overload → Single-Turn Interaction
Otherwise → Multi-Turn Interaction
Conversational Result Interaction Model

Document Overview

Further Details

Information Unit Exploration

Information Request

Navigating Directive

Further Details

User
Agent
Conversational Recipe Search Prototype

- Prototype developed as an Alexa Skill
- Corresponds with the two parts of the proposed model
  - Recipe search: Document search
  - Cooking instruction: Result interaction
Conversational Recipe Search Prototype

Data Collection

Alexa Skill Development
Conversational Recipe Search Prototype

- Raw-Data Collection
- Mining and Corpus Construction
- Indexing

- Alexa Intent Definition
- Search Engine Creation
- Response Computation
Conversational Recipe Search Prototype

- Crawling of 8,302 eHow and 9,751 wikiHow HTML pages
- 17,307 JSON documents
Conversational Recipe Search Prototype

- Corpus document structure:
  - title: string
  - articleID: string
  - intro: string
  - category: [string]
  - related: [string]
  - tips-warnings: [string]
  - ingredients-thingsneeded: [{
    - part-ingredients: [string]
    - list-name: string}
  - parts: [{
    - part: string
    - steps: [{
      - step: string
      - sub-steps: [sub-step: string]
      - tips: [string]}]]}]

- Three levels of abstraction of instructions
Conversational Recipe Search Prototype

- Raw-Data Collection
- Mining and Corpus Construction
- Indexing

- Five index fields: title, id, ingredients, categories and file path
Recipe Search

Users are able to search according to:

- Title
- Category
- Ingredient

If users don’t know what to cook at all and need recommendation:

- The system asks users questions to discover their needs
- History logs helps with identifying users’ preferred items
Recipe Search

- Results are presented one at a time
- Denied recipes won’t appear again in the current session
- Users may request information about the results' ingredients to help with decision
- Experimental cooking ontology for searching
Cooking Instruction

Document overview:
- If the recipe consists of multiple parts or methods, read method names
- Otherwise, or when a method is chosen, read summarized ingredients

Instruction:
- Assistance for ingredients preparation
- Step-by-Step cooking instruction with two levels of detail
Cooking Instruction

Retrieval of parts/methods or ingredient lists:
- Retrieval by index
- Similarity computation
  - Levenstein’s algorithm
  - Longest common substring

Machine Comprehension API
- Allow users to asks about cooking time or ingredients’ quantity

“..Method 9, Microwaved Scrambled Eggs…”
“Microwaved”
Future Work

- Cooking duration prediction
- Evaluation study

Improve:
- Integration of cooking ontology
- Customization of system properties
- User question handling
- User preference learning
Conclusion

1. Conversational information retrieval model
   
   RQ1: How to present results using audio?
   RQ2: How should a new information seeking model look like?

2. Prototype of conversational recipe search
Thank you for your attention!

Question Time