Dialog Strategies for Multi-parameter Search
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Agenda

- Multi-parameter Search Overview
- Strategies to simplify multi-parameter search
- Comparison of 3 such search systems
Multi-parameter search – Definition:
- Search scenario where a caller has to select several criteria to complete a search.
- Dialog structure depends on the sequence

Example: movie show time search:
- At call start, listen for all main parameter types
- Parameters: Theater, Movie name, Date
- Theater -> Movie = List of movies at a given theater
- Movie -> Theater = List of theaters for that movie
Spoken Multi-parameter search

Multi-dimensional search task represented in one-dimensional voice channel!
Spoken Multi-parameter search

**Challenge 1:** Offer different search modes without elaborate prompting

**Challenge 2:** Multiple turn browsing:
- which parameter selections to change
- Which parameter selections to keep/discard if callers undertake corrective navigation (such as ‘go-back’ and ‘start-over’)

**Challenge 3:** What commands / parameter selection options to offer in edge cases like a movie not playing or ambiguous movie titles

**Proposed Strategies**

A) Lay-out each sequence of parameter selections
B) for each parameter selection, consider different way of selection
Laying out search paths: Example Theater paths

Breakdown of first selected parameter

- Movie: 28%
- Theater: 72%

Handle:
- Special movie types
- Movies not yet release
- Movies not playing at this theater
- Movies sold out.....

Confirmation

Disambiguation

Movie List at theater

Post Movie Command List

Helpful approach:
Create a use case for each scenario
## Location search data sources

<table>
<thead>
<tr>
<th>Data source</th>
<th>Use Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Local repeat caller database</td>
<td>Repeat caller database stores favorite theaters for a given ANI</td>
</tr>
<tr>
<td>2 Phone number based location</td>
<td>(a) Determines if calls is on mobile or landline (b) If landline, narrows radius of search</td>
</tr>
<tr>
<td>3 Speech</td>
<td>(a) Spoken city and state (b) List selection</td>
</tr>
<tr>
<td>4 DTMF</td>
<td>Handling performance breakdown due to noise etc</td>
</tr>
<tr>
<td>5 GPS location from a smart phone</td>
<td>For cellphones, easily detect caller’s location</td>
</tr>
</tbody>
</table>

### Breakdown of different location search modes

- **Favorite Theater**: 44%
- **Theater at GetLocation**: 2%
- **Theater List**: 7%
- **Theater for Movie**: 10%
- **Finder Theater**: 37%

*Not just a speech recognition task!*
Use Case: Once a theater has been found, application offers caller to save this theater as a ‘favorite theater’.

If caller calls back on same phone number, system looks up favorite theater.

Theater parameter found with 1 simple (yes/no) dialog turn

<table>
<thead>
<tr>
<th>System</th>
<th>Hi! Thanks for calling XYZ Entertainment. Would you like to hear what’s playing today at the Studio 30 with IMAX?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caller</td>
<td>yes</td>
</tr>
<tr>
<td>System</td>
<td>Here’s what’s playing at that theater. You can say the name of a movie at any time, or just say ‘That One’ when you hear the one you want.</td>
</tr>
<tr>
<td>System</td>
<td>10,000 BC, rated PG13.</td>
</tr>
<tr>
<td>Caller</td>
<td>That one.</td>
</tr>
<tr>
<td>System</td>
<td>Okay</td>
</tr>
<tr>
<td>System</td>
<td>For 10,000 BC, here are the remaining available show times: 1:20PM, 2:50PM, 4:10PM. You can say Buy tickets or Repeat Show times. For a different movie, say Go Back.</td>
</tr>
</tbody>
</table>
Call duration for caller’s with a favorite theater is 25 sec shorter (average call duration is 120 sec).
- 53% of callers accept offer to save favorite theater
- 33% of callers have a favorite theater saved.
- 85% say ‘yes’ to the offer to hear ‘what’s playing at theater XYZ’
Use case A:
System needs to find location after movie is given
- System takes local exchange location to find closest theaters

Use case B:
Caller says name of a theater that is ambiguous
- System takes local exchange location to determine which theater
- Saves 1 dialog disambiguation turn
(3) Speech recognition

- If nothing else is known,
  - Listen for any City/State in the US
  - Listen for any theater name in the US
  - Used for 2% of calls

- Metrozone disambiguation
  - If caller says ‘Los Angeles’
    - many theaters within that area
    - Narrow down by asking for neighborhoods/borrows like “Burbank”, “West LA”
(4) DTMF fallback

- Noise and side-speech in about 10-15% of calls

- Need for DTMF fallback for noise/side-speech
  - Limits dialog flexibility, i.e. one-dimensional search

- Use dialog memory to mediate recognition problems
  - Per call caller experience score
  - Threshold to transition to run-time configurable
  - If score over threshold, turn-off speech
  - Makes interaction slower but eliminates noise problem

- Example: Location detection via DTMF:
  - Zipcode
  - ‘#’ selection from a list
(5) GPS driven location detection

- Alternative location detection for cellphones with GPS features
- Allows for **high accuracy** location detection, still requires to present list of theaters in that area to caller.
- Currently only in demo mode
Other parameters: Movie Selection

Three primary modes

- At call start application listens to any movie playing nation-wide (or theater)
  - Synonyms: semi-automated generation mechanism

- Once theater is selection, play list of movies
  - Offers selection alternative if movie name isn’t recognized

- Multiple-turn browsing
  - Throughout application listen for movies or theaters in the background in addition to commands listed in the prompting
Other parameters

- **Date**
  - Callers primarily call about movies on the same day
    - Application assumes today, but offers a command to change the day

- **Ticket purchase**
  - Requires additional selection of
    - Movie show time
    - Ticket quantity

- **Directions to a theater**

- **Miscellaneous**
  - Gift card, lost & found, opening hours, reward card information

All these parameters / options need to be presentated where appropriate throughout call!
Comparison of 3 movie search systems

Usability study compared 3 commercial movie search systems

- System 1: Speech/DTMF/favorite theater feature
- System 2: Speech/DTMF, local exchange search
- System 3: DTMF only
Comparison of 3 movie search systems

Effective search strategies shorten call duration
Conclusion

Discuss multi-dimensional search challenge in voice domain

Two main strategies:
- Give callers flexibility to search as they like: multi-dimensionality
- Use different strategies to determine search parameters the caller is looking for in order to minimize speech recognition weaknesses