Adjusting to User's Style in Dialogue Systems

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Outline

- Basics
- Previous Work
- Current Experiment
- Conclusion
Basics

- **A dialogue system (DS)** - a type of user interface (UI) where linguistic features act as UI controls for selecting data in software applications.

- The DS is intended to converse with a human, with a coherent structure:
  - turn-taking
  - initiative
  - significant silence
  - manners
Text-Based DS

- User input is a **written** request to the dialogue system in a natural language and the output of the system is a **written** answer to the user in the same language.
- Incl. optional speech synthesis.
- No speech recognition.

```
Speech Recognition <-- text --> Dialogue Management Engine <-- text --> Speech Synthesis
```
Previous work

- Web based DS framework to build dialogue systems for Estonian language

- Framework features:
  - automated spell check of user input
  - morph. analysis – stems in rules
  - solution to the word-order problem
  - human-assisted chat
  - sms notification
  - speech synthesis integrated
  - asynchronous model
<table>
<thead>
<tr>
<th>Time</th>
<th>User</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>16:12.41</td>
<td>User</td>
<td>mul on alalõuas eemaldatud hammas, juba 20 aastat tagasi</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>I have a tooth removed from the lower jaw 20 years ago</em></td>
</tr>
<tr>
<td>16:12.57</td>
<td>User</td>
<td>kas on võimalik sinna <strong>implanaati</strong> panna</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>is it possible to get a dental implant</em></td>
</tr>
<tr>
<td>16:13.00</td>
<td>System</td>
<td>põhjalikum info on siin: [loe implantaatidest]</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>more information can be found here [read about dental implants]</em></td>
</tr>
<tr>
<td>16:13.10</td>
<td>System</td>
<td>üks hetk, kohe räägin teile lühidalt implantaadi paigaldusest</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>just a moment, I’ll tell you about the installation of dental implants</em></td>
</tr>
</tbody>
</table>
- Kinoagent - 24h

Teema: filmid Tartu kinodes ...

<12:40 Alfred>: tere
<12:41 Alfred>: hetkel on Tartu kinokavades kokku 21 erinevat filmi
<12:41 Sina>: palun ole vait hetkeks
<12:41 Alfred>: vaid jään siis, kui saab öeldud, mis öelda on :)
<12:41 Alfred>: see võib ka täästa hea olla: homme, kell 24:30 - "Dredd", kinos Ekraan

Sina: [Input field] ▶
The Asynchronous Communication (1)

- “Stuck in input phase” problem.
- Both parties can:
  - provide input at any given moment,
  - take any number of sequential turns without waiting for the other party to acknowledge each turn.
- Real-time user-initiated (or system initiated) interruptions.
The Asynchronous Communication (2)

Browser

HTML Page

Javascript Calls

Updated HTML

Browser

AJAX Routines

Data Request

Updated XML Data

Server

Initial Page request
Spell-Checking and Error Correction

- String Similarity: Jaro-Winkler

- Domain Lexicon
  - contains the words from the patterns
  - compare lexicon with input
  - language independent

- Why not Levenshtein? Jaro-Winkler gives more favorable ratings to strings that match from the beginning.
Need to improve the spell checker

- add all forms to lexicon (not just lemmas)
- “valutama” generates:
  - valutab
  - valutas
  - ...
- this gives us a better lexicon and similarity to input can be higher
Word order (1)

- Need to be able to match both of these:
  - hammas valutama
  - valutama hammas

- Pattern would be:
  - (hammas valutama) | (valutama hammas)

\[ P_3 = 6 \quad (w_1 w_2 w_3) | (w_1 w_3 w_2) | (w_2 w_1 w_3) | (w_2 w_3 w_1) | (w_3 w_1 w_2) | (w_3 w_2 w_1) \]

\( W_i \) can be a regular sub-expression

\[ P_4 = 24 \quad \ldots \ldots \ldots \]

Solution: use permutations of input if set so in the pattern

Pattern: hammas valutama

IGNORE_WORD_ORDER: YES
Claim: The word order problem can be solved without complete syntactic analysis.

SUBJECT = hammas
VERB = valutama
The client-server model of the ADS framework

Client-side modules
- Wizard of Oz client (AJAX)
- Conversation client (AJAX)

Server-side modules
- Web server (Apache, PHP)
- Database server (Oracle)
- Dialogue Management Engine (PL/SQL)
- Morphology module (C++)

Remote services (external)
- Speech-synthesis server http://kiisu.eki.ee
- SMTP server
- Optional remote database

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Goal of the new experiment

☐ Can we adjust to user’s style?
  ■ capitalization
  ■ typing speed
  ■ slang

☐ Would it make a difference in user experience?
Motivation

- The users seemed to complain about it.
  - too slow
  - too fast
  - don’t like capitalization
  - do like capitalization
Implementation

- We implemented the new features.
  - speed module
  - capitalization module
- Then created a sample system.
- Tested it on 15 users.
- Finally, we had them fill out a form.
Results

- Users liked it when DS used their speed/style.
- Some users prefer faster response even if they are slow in typing.
- Some users prefer correct capitalization even if they don’t use it.
- Surprisingly the users claim to use correct capitalization in CHAT, in reality 60% of the users don’t.
Conclusion

- We decided to accept commands from the user:
  - “Please type faster”,
  - “Slow down a bit”.

- We could use correct capitalization always.