Denis Lalanne (UniFr)
IM2 Summer Institute
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Partners

• Current and past Partners:
  – DIVA/UNIFR: Denis Lalanne, Maurizio Rigamonti, Florian Evequoz, Bruno Dumas
  – IDIAP: Andrei Popescu-Belis, Mike Flynn, Alexandre Nanchen, Quoc Anh LE, Majid Yazdani (Pierre Wellner, Alex Jaimes)
  – CGC/EPFL: Martin Rajman, Miroslav Melichar, Marita Ailomaa
  – ISSCO/UniGe: Pierrette Bouillon, Manny Rayner, Nikos Tsourakis, Maria Georgescul, Agnes Lisowska

• Completed PhD (3):
  – Maurizio Rigamonti (UniFr), Miroslav Melichar (EPFL), Agnes Lisowska (UniGe)

• Current PhD (4):
  – Florian Evequoz (UniFr, 3rd year), Bruno Dumas (UniFr, 3rd year), Majid Yazdani (IDIAP, 1st year), Marita Ailomaa (EPFL)
Goals

- **Design** novel interactive meeting browsers
- **Develop** working prototypes, suitable for human testing.
- **Evaluate** the usability of these interactive prototypes with human subjects
Requirements elicitation: surveys

- **IM2 Internal:** about 300 sample queries to meeting databases
  - October 2002: workshop at UniGe

- **Multimodal interaction with meeting:** ~ 500 sample queries

- **End-user oriented:** 118 users
Wizard-of-Oz experiment

- Elicit user requirements by confronting users to a partially implemented meeting browser
  - controlled by two “wizards”
  - users unaware of them
- Recording
  - users: overall + face
  - input/output devices
  - wizards’ actions
- Analysis
  - user performance & errors + modalities used
- Some results
  - strong effect of training on modality preference
  - importance of spoken dialogue both for interacting and for indexing the recordings

Sources: (Lisowska, PhD 2007) and (Melichar, PhD 2008)
Meeting browsers and their evaluation

- Design of meeting browsers in IM2
  - fully automatic access to a database of processed meeting recordings (automatic or manual annotations)
  - voice-based, transcript/ASR-based, document-based, annotation-based, etc.

- Implementation toolkit: JFerret

- The BET: Browser Evaluation Test
  - Benchmark set of true/false “questions” for 3 meetings (AMI/IM2 Corpus)
  - 50-150 questions per meeting, good inter-observer agreement
  - Subjects answer questions using a meeting browser
Example of tested browser: FriDoc (then JFriDoc in JFerret)

- Document-centric browser
  - document alignments with transcript & video
- Compared enabled vs. disabled document-centric browsing, i.e. with vs. without links on documents
  - 8 users tested both options on different meetings
  - had to answer 12 questions each

→ Browsing is more efficient when document alignment to media is available than when it is not

<table>
<thead>
<tr>
<th>Results</th>
<th>all questions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#correct</td>
</tr>
<tr>
<td>without doc links</td>
<td>66%</td>
</tr>
<tr>
<td>with doc links</td>
<td>76%</td>
</tr>
</tbody>
</table>
## Browser evaluation at a glance

<table>
<thead>
<tr>
<th>Browser</th>
<th>Condition</th>
<th>Nb. of subjects</th>
<th>Time per question (s)</th>
<th>Precision</th>
<th>Stdev*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio-based browsers</td>
<td>Speedup</td>
<td>12</td>
<td>99</td>
<td>0.78</td>
<td>0.06*</td>
</tr>
<tr>
<td></td>
<td>Overlap</td>
<td>15</td>
<td>88</td>
<td>0.73</td>
<td>0.08*</td>
</tr>
<tr>
<td>JFerret sample</td>
<td>BET set (pilot)</td>
<td>10</td>
<td>100</td>
<td>0.68</td>
<td>0.22</td>
</tr>
<tr>
<td></td>
<td>Gisting (5 questions)</td>
<td>5</td>
<td>max. 180</td>
<td>0.45</td>
<td>0.34</td>
</tr>
<tr>
<td></td>
<td>Factual (5 questions)</td>
<td>5</td>
<td>max. 180</td>
<td>0.76</td>
<td>0.25</td>
</tr>
<tr>
<td>Transcript-based browser</td>
<td>1st meeting</td>
<td>28</td>
<td>228</td>
<td>0.80</td>
<td>0.09*</td>
</tr>
<tr>
<td>(TQB)</td>
<td>2nd meeting</td>
<td>28</td>
<td>92</td>
<td>0.85</td>
<td>0.06*</td>
</tr>
<tr>
<td></td>
<td>Average on both meetings</td>
<td>28</td>
<td>160</td>
<td>0.82</td>
<td>0.06*</td>
</tr>
<tr>
<td>Document-based (FrDoc)</td>
<td>With speech/document links</td>
<td>8</td>
<td>113</td>
<td>0.76</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>Without links</td>
<td>8</td>
<td>136</td>
<td>0.66</td>
<td>n/a</td>
</tr>
<tr>
<td>Archivus multimodal</td>
<td>T/F questions</td>
<td>80</td>
<td>127</td>
<td>0.87</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>Open questions</td>
<td>80</td>
<td>==</td>
<td>0.65</td>
<td>0.22</td>
</tr>
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- **Average performance (now state of the art):**
  - 70-80% precision, 0.5-1.0 questions per minute
- BET confirmed as a good indicator of human + browser performance on the information extraction task
## Synthesis

### Stages in software lifecycle

<table>
<thead>
<tr>
<th>Interviews and questionnaires to focus groups (requirements elicitation)</th>
<th>Wizard-of-Oz studies</th>
<th>Research prototypes of meeting browsers and assistants</th>
<th>End-user products (e.g. commercial)</th>
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### Achievements

| Databases of queries to meeting archives, and sets of other meeting browsing tasks | Archivus | FaericWorld JFerret demo JFriDoc TQB VICoDE Speech-based browsers Idiap | Klewel SMAC |

### Assessment or evaluation methods

| Statistical analysis (to infer user requirements) | Performance measures, behaviour analysis | BET (task-based) and other efficiency/ usability metrics | Customer satisfaction |

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IM2 Summer Institute, 2009
Extended objectives

Meeting
browsers (offline)
assistants (online)
Off-line Meeting browsers/assistants

• **Extended JFerret & the Hub**
  – To ease development of online meeting browsers and assistants (through the Hub client-server architecture for real-time exchange of annotations)

• **Mobile meeting browsing**
  – The Multilingual Multi-Modal Application (M3C)

• **Cross-meeting browsing**
  – E.g. FaericWorld
    • Complete end-to-end system (data to users)
    • Full AMI/IM2 + UniFr Corpus (193 meetings)

• **Personal Access to Meetings**
Online meeting browsers/assistants

• **Online meeting assistants**
  – E.g.:
    • Live content linking between meeting documents and live ASR (through the Hub)
    • Turn taking assistant
    • Live interaction with physical documents

• **Remote & mobile meeting assistants**
  – MMA Mobile meeting assistant (through the Hub)

• **Frameworks**
  – Jferret & Hub, HephaisTK
User evaluations of meeting assistants & browsers

• Automatic BET answering
• Field study of Automatic Content Linking Device in two meeting rooms
• Naturalistic study with 12 users of Personal Information Management strategies
• Evaluation of technology impact over stress (120 job interviews recorded in SMR)
• Evaluation of Mobile meeting Assistants (MMA & M3C)
• Evaluation of TableMind with 16 users
• Special session on user evaluation of meeting browsers organized at MLMI 2008
• Synthesis of HMI activities in a journal article
Wrap up

- Both user-based vs. technology-based useful to make progress, many connection points

- Dissemination
  - 1 conference chaired (UIST 2008 by P. Wellner)
  - 2 workshops & special session (MLMI 2008)
  - 1 demo session (ICMI-MLMI 2009)
  - 1 book
  - 10 journal articles
  - 60 conference articles (peer reviewed)

- Future
  - Continuation of research activities on online meeting assistants in IM2 phase III (IP1 and IP2)
  - HMI Institute in Fribourg (Human-IST)