Real-time Sociofeedback: A VoIP Application and a Correlation Study

presented by

Debsubhra CHAKRABORTY
PhD student
Institute for Media Innovation/ Interdisciplinary Graduate School

Supervisor: Asst. Prof. Justin Dauwels (EEE)
Co-Supervisor: Prof. Daniel Thalmann (IMI/SCE)

21st May, 2015
Outline

• Introduction

• VoIP Application

• Corpora

• Correlation Study

• Conclusion
Introduction

• Computers from tools to facilitating human-human interaction to social robotics
• Social Signal Processing – endow computers with social intelligence


Introduction

- Social signals – key to SSP
- Social signals contain non-verbal cues

Existing methods – offline analysis, one or two social signals, no additional video data used, rule-based, no feedback


Our Approach

- Applications: Skype interview or online course
VoIP Application: A Demo
VoIP Application

SuperTintin for Skype
- Records each speaker on separate .mp4 files
- Segments of 1 minute

Matlab
- File event handler analyzes each new file saved
- Separates audio from video
- Uses trained machine learning models on audio to get sociometrics

Skype
- Use Skype API to conveniently display the sociometrics
Machine Learning

- Different machine learning algorithms to obtain best classification result

- Model training is performed on two corpora: AC and AVC
Corpora

Audio Corpus (AC)
- Audio on separate microphones
- No video
- 150 recordings
- 2.5-3 minutes long
- 22 participants (17 M, 5 F)
- Both speaker participants

Audio-Visual Corpus (AVC)
- Audio on separate microphones
- Video on separate Kinects
- 100 recordings
- 1 minute long
- 21 participants (16 M, 5 F)
- One speaker participant, other control
Feature Extraction

- Speech detection using HMM
- Prosodic cues computed over 30 ms
- Visual cues from RGB + depth data from Kinect

Annotation Protocol

- Each recording annotated by multiple judges
- Annotation on likert scale ranging from 1 (low) to 3 (high)

Speaker 1

On a scale of 1 to 3, please rate the politeness of Speaker 1 during the conversation:

<table>
<thead>
<tr>
<th>Corpora</th>
<th>Maximum SD</th>
<th>Minimum SD</th>
<th>Mean SD</th>
<th>Median SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>0.55</td>
<td>0.24</td>
<td>0.45</td>
<td>0.47</td>
</tr>
<tr>
<td>AVC</td>
<td>0.51</td>
<td>0.24</td>
<td>0.41</td>
<td>0.43</td>
</tr>
</tbody>
</table>

## Classification Results

- Leave-one-person-out cross validation technique

<table>
<thead>
<tr>
<th>Sociometric</th>
<th>AC</th>
<th>AVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agreement</td>
<td>84 %</td>
<td>81 %</td>
</tr>
<tr>
<td>Dominance</td>
<td>86 %</td>
<td>90 %</td>
</tr>
<tr>
<td>Interest</td>
<td>85 %</td>
<td>92 %</td>
</tr>
<tr>
<td>Politeness</td>
<td>81 %</td>
<td>76 %</td>
</tr>
<tr>
<td>Friendliness</td>
<td>51 %</td>
<td>63 %</td>
</tr>
<tr>
<td>Frustration</td>
<td>50 %</td>
<td>67 %</td>
</tr>
<tr>
<td>Empathy</td>
<td>59 %</td>
<td>67 %</td>
</tr>
<tr>
<td>Respect</td>
<td>59 %</td>
<td>62 %</td>
</tr>
<tr>
<td>Confusion</td>
<td>81 %</td>
<td>89 %</td>
</tr>
<tr>
<td>Hostility</td>
<td>77 %</td>
<td>72 %</td>
</tr>
</tbody>
</table>

Correlation Study

• Understand interrelationships between indicators (sociometrics) and features

• Express them in a visually engaging manner

• Identify redundancies

• Boost existing classification
Correlation: Between Indicators

Correlation: Indicators & Features
Conclusion

• Feedback of social states in real-time is important in certain situations

• Such feedback can be provided through VoIP

• Such feedback is based on machine learning of annotated corpora

• Correlation study of corpora can help us understand important relationships
Acknowledgements

• Asst. Prof. Justin Dauwels for his thoughtful insights

• Yasir Tahir and Tomasz Maszczyk for their generous help

• IMI and IGS at NTU for supporting this research
THANK YOU for listening - ANY QUESTIONS?