Analysis of laughter from full-body movement

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Objective

Automatic detection of

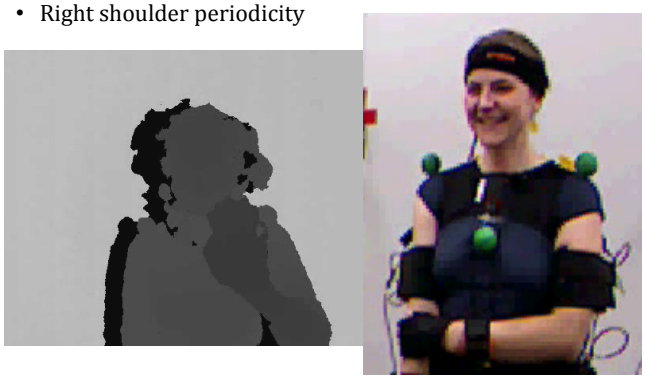
- Laughing and non-laughing segments
- Laughter intensity
- Laughter style

from ***full-body movement features***.

Feature extraction

From Kinect depth image and coloured markers

- Head up-down
- Head left-right
- Trunk leaning
- Trunk periodicity
- Trunk amplitude
- Trunk impulsivity
- Shoulders correlation
- Left shoulder periodicity
- Right shoulder periodicity



From MoCap data (Xsens) features characterising

- Hands movement and gesture
- Shoulders movements
- Spine and neck bending

(*Features extracted by University College London. See* [1])

Corpora

- MMLI: Multimodal Multiperson Corpus of Laughter in Interaction [2]
  - 6 sessions with 16 participants: 4 triads and 2 dyads
  - 4 hours and 16 minutes of data
  - 439 laughter events 31 minutes (12%)
  - 6 different tasks for inducing laughter
- Kinect and video recordings
  - 5 participants
  - 1 hours and 20 minutes of recordings
  - 201 laughter events
  - 2 tasks

Real-time feature extraction and analysis performed with EyesWeb XMI

Acknowledgements

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- Analysis of laughter style for mimicry is carried out in ILHAIRE in a collaboration between Casa Paganini – InfoMus and University College London.

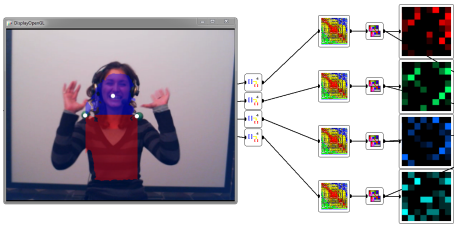
Analysis of laughter intensity

Analysis

- On-purpose recorded video annotated by two raters
- Four intensity levels: Low, Medium-Low, Medium High, High
- Supervised Kohonen Self-Organising Maps trained on depth image and coloured markers features
- Inter-rater agreement between automatic classification and raters' annotation: *Cohen's kappa* = 0.42 ($p < 10^{-6}$)

Research challenges

- Multimodal fusion with speech and facial expressions [3]
- Classification of laughter categories (e.g., hilarious and conversational laughter)
- Role of context and culture



Analysis of laughter style

Laughter style conceived as

- The subset of features that allows recognising laughing from not laughing in the most accurate way
- The range of values of such features

Analysis

- Under-sampling and over-sampling techniques applied to handle unbalanced datasets
- Feature selection carried out by applying *Corona* (*Correlation as Features*) [4]. Corona allows treating data as time series, taking into account the time dimension, rather than usual window-based approaches
- *Average Tanimoto Index* [5] to measure robustness
- Similarity of histograms to analyse range of values
- Analysis applied to features from MoCap computed on one task of the MMLI corpus
- Compared features selected in the first half and second half of the task
- Initial results: a convergence between the laughter styles of participants emerges in the second half of the task, e.g., in terms of increased use of hands

Research challenges

- Using laughter style for analysis of short-term and long-term mimicry
- Understanding the role of social interaction, e.g., leadership, in possible convergence of laughter style

References

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