Emotion Recognition Based on Signal Processing

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Why Emotion Recognition in HCI?

1. Natural way of interaction for humans
2. Computers will understand human input more precisely and respond accordingly
3. Ease interaction between human and computers
How We recognise emotions

✓ Emotions from speaker’s tone
✓ Emotions from facial expressions
✓ Emotions from Body Gesture

P. Ekam’s 6 basic Emotions (Universal)

- sadness
- disgust
- anger
- surprise
- fear
- happiness
Why recognizing emotions is difficult for a computer.

Differentiating Emotions

- Acted
- Spontaneous

Emotions Depends on

- Gender
- Age Group
- Cultural Diversity
Emotion Recognition modals

- User dependent
  - Uni-modal
  - Bi-modal
  - Multi-modal

- User independent
  - Speech Emotion Recognition
  - Facial Emotion Recognition
  - Body Gesture Recognition
Speech Emotion Recognition

Verbal Communication contains 45% of emotion information

- Voice intonation 38%
- Actual word 7%

Availability of sufficient dataset is major concern
Speech Emotion Recognition

Tree diagram for types of Features:
**ACOUSTIC ANALYSIS**

- Pitch
  - Direct contour
  - Derivate contour
  - Statistical feature extraction

- Intensity
  - Direct contour
  - Derivate contour
  - Statistical feature extraction

- Spectral Bark Band Energy
  - Direct contour
  - Derivate contour
  - Statistical feature extraction

- Cepstral MFCC
  - Statistical feature extraction

- Voiced Segment Durations
  - Statistical feature extraction

- Silence lengths
  - Statistical feature extraction

- Automatic classification system

- Recognition Accuracy is 74.2%

**COMBINING ACOUSTIC WITH LINGUISTIC ANALYSIS**

- Testing acoustic files
- Text processing
- Language model
- Acoustic models
- Search engine
- Pronunciation dictionary

- Transcriptions
- Feature extraction
- Training acoustic models

- Recognition Accuracy is 59.6% (only Linguistic)
- Recognition Accuracy is 92% (Combination)
Applications

- Smart Call Centre
- Sorting voice mail
- Lie-detection
- Will improve intelligent assistant like Siri and google now

Etc.

✓ Enable a natural interaction with the computer by speaking instead of using traditional input devices and not only have the machine understand the verbal content.
Facial Emotion Recognition

- Contain major emotion information
- Efficient Dataset Available
Applications

➢ Intelligent Online tutoring system
➢ Detecting Emotions of Driver
➢ Smart Computer/ Mobile interface
Etc.
Multi-modal Emotion Recognition

L. Kesseus multimodal Emotional recognition

- acoustic analysis for speech emotion recognition
- best probability approach for decision level fusion
- overall performance of system improved
- No universal dataset Available
Overall Performance Comparison of Uni-modal, Bi-modal and Multi-modal systems

Percentage of instances correctly classified in different modals in L. K esseus experiment.

- **Speech Emotion**: 57.1%
- **Facial Emotion**: 48.3%
- **Body Gesture**: 67.1%
- **Overall**: 78.3%

Values:
- 62.5%
- 75%
- 65%
Current Technologies

Emotient
An artificial intelligence startup that can read your mind. It predicts attitudes and actions based on facial expressions. It is used by advertisers to monitor and assess reactions to their ads and products from potential customers.

Affectiva
Developed a way for computers to recognize human emotions based on facial cues.
Affectiva's technology can enable applications to use a webcam to track a user's smirks, smiles, frowns and furrows, which measures the user's levels of surprise, amusement or confusion.
Feeling sad, angry? Your future car will know.
It determine if that driver is angry, sad, happy, surprised, fearful, disgusted or expressing no emotion.

Some of the features of Emovu DMS
➢ Fear reaction when the brakes are applied.
➢ Sleepy while driving
➢ Pre-crash actions, such as tightening seat belts or preparing braking
➢ Correlating driver emotions to particular location.

An autonomous car of the future could actually take over the driving if it felt its human wasn't up to the task.
References:


