AN ACOUSTIC ANALYSIS OF SHARED ENJOYMENT IN ECA INTERACTIONS OF CHILDREN WITH AUTISM

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INTRODUCTION AND MOTIVATION

• Social interaction deficits: main symptoms of people diagnosed with autism.
• Shared Enjoyment: the “pleasure in interactive participation or conversation”.
• Laughter: objective expression of shared enjoyment.
  • Voiced -> positive affect
  • Unvoiced -> social facilitator

Voice/Unvoice Laughter

Different Social Functions

Social Zones of Voiced/Unvoiced Laughter

Different Feature Level Patterns

RACHEL ECA INTERACTION CORPUS

• Recordings of a child interacting with an ECA (Embodied Conversational Agent), Rachel, and his/her parent.
• Designed to encourage children to:
  • Participate in social interactions
  • Display their emotional reasoning abilities

Subjects | S1 | S2 |
---|---|---|
subject description | 12-year old boy | 6-year old boy |
expressive language score | 6 years, 7 months | 2 years, 9 months |

ANALYSIS OF SHARED ENJOYMENT INSTANCES

• S1: 189 laughter instances
• S2: 82 laughter instances
• Differences in the content of social interactions between the two subjects.

[Graphs showing laughter instances]

METHODS

• Social Zones
  • Areas before/after laughter instances
  • Duration of 2,4,6,8,10 sec
• Features
  • Pitch, intensity, 13 MFBs (Mel-Filterbank Coef.)
  • Mean, stand. dev., skewness, kurtosis, 25%, 75% quartile, quartile range
  • Computed over 0.5, 1, 1.5, 2, 2.5 sec.
  • Dimensionality reduction with PCA (Principal Component Analysis)
• Classifier
  • Naive Bayes
  • Leave-one-laughter instance out cross-validation

EXPERIMENTS

• Socially Relevant Information Retrieval
  • Project original 120-dimensional feature vector to different PCA components
  • 10 least significant PCA dimensions -> shared enjoyment information
• Laughter Classification
  • 85.2% for S1, 96.5% for S2 (2.5s window)
  • Larger windows -> better results
  • Laughter incidents from S2 more differentiable
• Social Zones Classification
  • 74.4-95.9% for S1, 94.3-99.6% for S2
  • 10 sec -> interval with useful information for predicting social interaction

[Graphs showing analysis results]

DISCUSSION AND CONCLUSIONS

• Acoustic patterns of social zones are indicative of the type of shared enjoyment.
• Difference in the ways the studied children engaged in social interactions
• Shared enjoyment instances are more prominent than instances negotiating social subtleties.
• Future directions: examine identity of speaker, lexical content and visual cues of social zones.

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