Acoustical Analysis of Engagement Behavior in Children

Rahul Gupta 1, Chi-Chun Lee (Jeremy) 1, Daniel Bone 1, Agata Rozga 2, Sungbok Lee 1, Shrikanth S. Narayanan 1

Signal Analysis and Interpretation Laboratory (SAIL), University of Southern California 1
School of Interactive Computing, Georgia Institute of Technology 2

Motivation & Introduction

- Autism spectrum disorders (ASD) are developmental disorders that result in impaired
  Social interaction and reciprocity
  Expressive and receptive language
  Restricted and repetitive behavior
- ASD a spectrum disorder due to the extreme heterogeneity of symptomatology
- Recent prevalence studies indicate as many as 1 out of 80 children has ASD

  Joint attention behavior
    - Children's speech and language development (Moore and Dunham, 1995)
    - Characterization of atypical behavior in Autism Spectrum Disorder (ASD) (Kundu et al., 1996)
  - Children's engagement behavior
    - Closely related to aspects of joint attention
    - Bring insights into social communicative behavior for child on the spectrum

Hypothesis: Engagement level of children is reflected in the vocal cues of the child and the psychologist while participating in tasks largely requiring visual joint attention

Classification Framework

The R-ABC database

- Collected as part of a larger NSF funded study
- Non-verbal children (9-30 months old) – Only TD at the moment
- 3-5 minute-long interactive assessment protocol
- 5 different tasks designed to elicit key social communicative behaviors
  - Smiling and saying “hello”
  - Ball play
  - Jointly looking at a book
  - Putting on a book on your head as if it is a hat
  - Smiling and tickling
- 50 sessions of 5 tasks each: 250 sub-sessions
- Audio, video, electro-dermal activity recordings
- Psychologist rates the child engagement into 3 levels

Classification Framework

Discussion & Future Work

- Acoustic features are predictive of child’s engagement level
- Easier discrimination between engaged vs. disengaged as compared to two subclasses of disengagement
- Use of other cues (visual, EDA) not included

Future work

- Use of temporal relationship between engagement levels across sub-sessions
- Inclusion of other types of speech cues
- Continuous measure of engagement level

http://sail.usc.edu
This work was supported by NSF.