Computer Speak

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Project to improve and develop word association for nonverbal autistic children

Introduction

About Autism Spectrum Disorder (ASD)
• Roughly 2% of the US population has ASD and ⅓ to ½ of them are nonverbal
• Children with ASD have less effective communication skills than neurotypical children of the same age
• Learning word associations is a critical skill in developing effective communication and is often extremely difficult for children with ASD

Our Approach
We want to incorporate digital flashcards with eye-tracking on the iPad, which is much more afffordable than other eye-gaze learning tools.
• Usage of smart tablets have been established as legitimate methods of education and have demonstrated improvement of communication skills in children with autism.
• Technology allows for a more specialized approach with personalized systems.

Prior Work

We will integrate our eye-tracking and flashcards, to build an affordable, accessible system for autistic children to learn.

Eye-Tracking
• Skyle for iPad
• Tobii Dynavox
Both use specialized camera components and are expensive to acquire. The Tobii tablet also requires expensive software like the Communicator 5 to function as a communication tool for nonverbal autistic children.

Digital Flashcards
• Grace
• Proloquo2Go
These are touch-operated only, and do not support eye-gaze interactions, which would be helpful for nonverbal autistic children to express their true interests and help those who have less developed motor skills

Methodology

Flashcard System
Educators are able to select vocabulary sets. As the children observe the image/animation associated with the word, the word is presented to them to read, and the next word in the set will appear.

Experience
• Portable iPad tablet & Accessible eye-gaze interaction

Backend
• ARKit framework for eye-tracking.
• Scalable backend so multiple users can access
• Microservice-based architecture arranging the applications as a collection of smaller services to ensure each service scales.
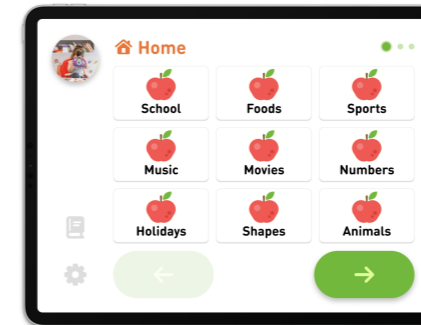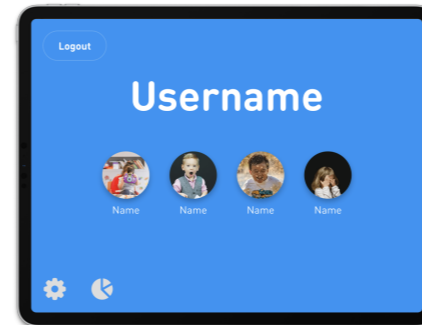
Evaluation

• **Efficacy**: if a majority of children using the app show an improvement in understanding the words. Due to limitations in the number of expected participants able to take part in the study, we are considering a more subjective and personal approach as opposed to more empirical means. We will compare differences in results between our system and an alternate system. After each session, we will ask the parents to answer some questions, and compare the scores and responses between the two sessions.

• **Ease of use**: the target audience (non-verbal autistic children) may not be able to express these thoughts. Due to its nature, it's probably best to use qualitative (descriptive) data using Likert scales and open-ended questions. We will ask parents/teachers to observe the child interact with both systems and answer questions that can help tell us which appears better.

• **Accuracy**: is our eye-tracking navigation accurate? We test this by giving participants a set of tasks and see the percentage of accurate interactions.