

Towards an Arabic Language Augmentative and Alternative Communication Application for Autism

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Abstract. In this paper we describe the development and evaluation of an iOS application designed as an augmentative and alternative communication (AAC) tool for individuals with speech and language impairments in Arabic-speaking populations. Formative evaluations carried out in different settings are described with insights obtained from involving users and domain experts in the User-Centered Design approach. Moreover, we summarize experts' reviews on the impact of using the developed application in special education classrooms.

1 Introduction

Verbal communication is essential for an individual's daily interactions with others, as it is the first tie to the world we live in. People with speech and language difficulties often experience barriers in understanding and using verbal language in communication. Speaking well-structured sentences and making themselves understood is a key challenge for them. Language impairments are linked to many disabilities such as Autism Spectrum Disorders and some cerebrovascular accidents such as strokes.

People with language impairments use augmentative and alternative communication (AAC) systems as assistive technology tools to help them in carrying out conversations in daily activities. AAC is a specialized area of the tools (high and low tech) that aim to develop techniques, aids and systems to improve the communication abilities of people with speech and language problems by the supplementation or replacement of natural speech [1].

This paper sheds light on user involvement in the design and development of AAC systems in general, and in the context of learning environments for children in particular. The system presented in this paper, called *'Touch-to-Speak'*, is a novel contribution to the AAC domain, by offering a portable and configurable AAC application that supports different dialects in the Arabic language as well as Modern Standard Arabic (MSA). This AAC application is envisioned as an assistive technology tool that can facilitate the integration of children with speech and language impairments in learning environments.

2 Background

Recent advances in mobile computing have facilitated rapid growth in AAC applications' design for tablets and mobile phones. Our research has concentrated on developing an Arabic computer-based application to enhance communication skills of people with autism spectrum disorders (ASD), with an emphasis on supporting verbal communication in local dialects as well as Modern Standard Arabic (MSA). Few AAC applications which support the Arabic language exist in the marketplace, and the ones that exist limit verbal communication to MSA despite the dominance of using local dialects in clinical settings for speech and language therapy as well as everyday communication in non-formal settings such as at home, leisure, and in most contexts in schools and at work. Consequently, the demand for AAC applications that support local dialects and have configurable settings for customizing the image-based communication and the spoken dialects has emerged. This is mainly to extend the therapy beyond the clinical settings and to facilitate communication in Arabic-speaking contexts. Anecdotal evidence together with publications in Arabic in the field of assistive technologies have highlighted the lack of AAC technologies supporting individuals with speech and language impairments, particularly in the Arabic language.

Applications for AAC are often Picture Exchange Communication (PECs) based interactive applications designed as communication solutions to help individuals whom experience difficulties in speaking to express their needs using pictures and/or typing coupled with automatically generated spoken dialog. Applications in this domain include Voice4u, TapToTalk, TouchChat, and Proloquo2Go [2]. Typical users for such applications are children or adults with ASD, Down Syndrome, Cerebral Palsy, Apraxia, Traumatic Brain Injury, ALS, Stroke (Aphasia) or other conditions that affect a person's ability to communicate effectively with natural speech.

Selecting the iPad platform for the initial proof-of concept phase for our application was based on the extensive body of research that has demonstrated how portable electronic devices (such as iPads) enhance the learning experience for children (e.g. [3], [4]). Moreover, evidence suggests that direct-manipulation interaction types that are inherent in touch screen interfaces are often easier to use for children in general and those with ASD in particular [5].

3 System Description

Inadequate support for Arabic-based AAC applications has motivated us to build Touch-to-Speak, an AAC application that is developed in the area of assistive technology to support people with communication difficulties. The target population varies in age groups and disabilities, as it includes children with autism and elders with stroke. Therefore, due to the different characteristics and needs of our target users, the application contains two separate interfaces. One interface is designed for children with ASD and is based on PECS adapted to the Arabic-speaking population.