

VITHEA-Kids: Improving the Linguistic Skills of Children with Autism Spectrum Disorder*

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Abstract. Each child with Autism Spectrum Disorder (ASD) has a unique set of abilities, symptoms and needs; hence, educational applications should allow to tailor exercises' content and options. However, most existing applications do not take this requirement into account. In this work, we present VITHEA-Kids, a platform that takes advantage of language and speech technologies tools to allow children with ASD to benefit from a customized learning experience.

Keywords: Computer-assisted language learning, Autism Spectrum Disorder

1 Introduction

Autism Spectrum Disorder (ASD) is characterized by persistent deficits in social communication and interaction, as well as restricted, repetitive behaviors or interests since an early age. It also often comprises difficulties in communication [2], but the challenges faced strongly vary across individuals. Given the interest that individuals with ASD display towards computers [6], educational applications could be useful to teach them new skills – an hypothesis experimented by several authors [7], which, along with the increasing popularity of mobile devices, has led to a great variety of applications targeting children with impairments (for a detailed review of related studies and applications, please refer to Mendonça [4]). However, there is a lack of applications in Portuguese that take into account each child's needs. In this context, we present VITHEA-Kids: a software platform in Portuguese where children with ASD can solve exercises to develop linguistic skills, having their needs accounted for. This platform makes use of in-house language and speech technologies to provide a customized experience.

2 VITHEA-Kids

VITHEA-Kids is a platform where children can solve exercises created by their caregivers. It was build using the infrastructure of an in-house award-winning

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platform: Virtual Therapist for Aphasia Treatment (VITHEA) [1], in which patients with aphasia could solve oral word naming exercises prepared by their therapists and presented by a talking animated character using a Text-To-Speech (TTS) synthesizer [5].

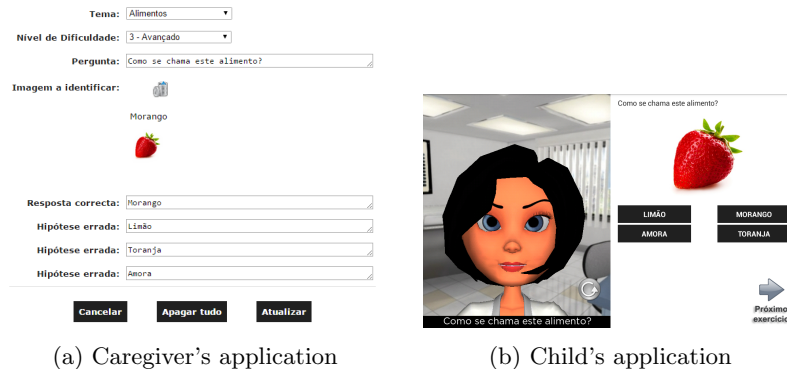
VITHEA-Kids allows to create multiple choice exercises, often used for children with ASD, allowing to work on skills such as vocabulary acquisition, word-picture association, and generalization. Each exercise is composed of a question (e.g, “What is the name of this object?”), an optional stimulus (e.g, the picture of a fork), and a set of possible answers, respectively (“Fork”, “Spoon”, “Cup”, “Bowl”), in which only one of the answers is correct. Wrong answers can go from zero to three, allowing to create different exercises with small variations.

VITHEA-Kids is composed of two applications, which will be live demonstrated during the conference (considering the availability of Internet connection). The caregiver’s application allows to create and manage the exercises described above (see Figure 1a), group them in ordered sequences associated with a set of children, upload and manage image files to use in the exercises, and manage the users of both applications. It also allows for the caregiver to customize the child’s application, namely the messages uttered by the animated character, through a TTS synthesizer [5], in certain situations (e.g, when the child logs in, or when they select a correct answer) and the images to display when the child correctly solves an exercise (as a way of reinforcing the correct choice). As for the child’s application, it presents the list of sequences associated with the child logged in. Upon choosing a sequence, each exercise is presented in the order defined by the caregiver. The exercise’s question is uttered by the animated character, and it is also displayed on the screen, along with the stimulus (when existing) and the possible answers in a random order (see Figure 1b). Tapping over the correct answer will lead to a reinforcement image and a customized feedback message uttered by the animated character. Selecting any other answer will activate a set of helping cues to prompt the child to select the correct answer: the selected answers disappears, the correct answer is highlighted and the remaining answers are uttered by the animated character. When the exercise session ends, information about child’s performance is shown.

To ease the caregiver’s task of creating new exercises, we also developed a module for the generation of multiple choice exercises based on a question template and a topic [4], although it is not integrated with VITHEA-Kids yet.

3 Conclusions and Future Work

In this work, we took the first steps into addressing the issues presented by the currently available software for individuals with ASD. Our platform makes use of language and speech technologies to support the development of Portuguese linguistic skills, allowing caregivers to create content and perform several customizations according to each child’s needs. These applications were evaluated with several caregivers and also with a child, as detailed in Mendonça [4]. Currently, we are performing several improvements to the platform, as well as ex-



(a) Caregiver's application

(b) Child's application

Fig. 1: VITHEA-Kids's applications

tending the possibilities of customization and the variety of exercises (including ones that could use an Automatic Speech Recognition (ASR) module [3] to validate oral answers).

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