Customizable Mobile Applications
For Improving Quality of Life of Autistic Teenagers

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Background
Currently, one out of eighty-eight children in US suffers from autism spectrum disorder (ASD). Children with ASDs suffer from several deficits e.g. poor communication and social skills. Some of them also show reduced attention to others’ faces, and hence have major difficulties in recognizing and responding to emotional and mental states in others’ facial expressions [1]. Such difficulties if persist when they become teenagers hamper their abilities to acquire job skills or live more independent lives.

Purpose
The emergence of powerful smartphones, tablets e.g. IPAD and Google Nexus 7 allow developers to produce many useful applications to help autistic children to develop their language or social skills. However, many existing applications target younger children and are not quite suitable for teenagers. In our project, we aim to develop mobile applications targeting autistic teenagers which are customizable to help them acquire some skills that can improve their quality of life. Specifically, we focus on three particular applications: (a) Emotional Recognition Training (ERT) Tool, (b) Conversational Simulator (CS), and (c) ATM Simulator. The ERT application aims to improve autistic children’s emotional recognition skills while CS helps to improve their conversational skills. The ATM simulator is being used at Centennial School (a special education school) to teach autistic students how to use ATM machines to deposit/withdraw money. The ERT application will be made accessible to others once we complete our user studies with a special education school and an autism center. The other two applications, already released as free applications, can be downloaded from graceland.herokuapp.com.

Methods
Previous research studies have shown that children with ASDs are attracted to systems such as vehicles, spinning objects or computers because such children have intact or even enhanced abilities in “systemizing”[2] which is the drive to analyze or build a system for predicting its behavior and/or controlling it. Such special interests can be harnessed in computer-based teaching tools to keep them engaged while using such tools for longer duration and also frequently. Thus, our applications include animation, visual, and audio features to make them attractive to teenagers with ASDs.

In addition, many existing tools e.g. Let’s Face It [3] provide videos/images involving actors or environments whom the students are not familiar with. However, some autistic teenagers learn better if they are shown images, or video clips of facial expressions from people with whom they are familiar with. Thus, in order to be effective, our emotional recognition tool is customizable, and contains adaptive contents which can be modified by caregivers, teachers or parents. Moreover, we intend to add appropriate audio and context information to help students with ASDs to generalize what they learnt from such a training tool. Furthermore, our applications run on mobile devices and hence makes they can be used anytime anywhere.

We typically use an iterative design/evaluate process for our application development. First, we gather design requirements by interviewing special education teachers/caregivers. Then, we recruit students from these schools to try our applications so as to gather some feedback. Next, we enhanced our applications to incorporate their feedbacks. For example, we added in a feature to select high/medium/low accuracy in our conversational simulator tool after we encounter a teenager with ASD that stammers. We provided a Mandarin-speaking version after we found more than 85% of the teenagers/children with ASDs at an oversea autism center speak Mandarin. We are currently conducting a small 3-month long user study (6 students) at two places. Students with emotional recognition deficits are identified by their teachers and will undergo training for 30 minutes/week using the learning module in our emotional recognition tool and will be tested using the test module.

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References