Off-line mobile-assisted vocabulary training for the developing world

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Abstract

Mobile-assisted language learning applications (MALL) has significant potential in the developing world where access to teachers and classrooms are real barriers to learning.

This demonstration of an Android-based mobile language learning application is used to teach vocabulary and employs off-line Automatic Speech Recognition (ASR) and Text-to-speech (TTS) technologies with custom-built language and acoustic models, incorporating the key design criteria outlined in the article.

Index Terms: Computer-assisted language learning (CALL), Mobile-assisted language learning (MALL), Automatic Speech Recognition (ASR), Text-to-speech (TTS) synthesis, Android, on-device ASR and TTS, game-based learning, developing world.

1. Introduction

Mobile-assisted language learning applications (MALL) could potentially cause a shift from teacher-centric learning where student participation is externally encouraged, to student-centric interactive learning with increased participation from each student [1]. This would be a positive shift especially in the process of acquiring a second or further language.

This article focusses on the the conceptual design aspects of a mobile vocabulary training application, and not on the need for such applications.

2. Approach

Various approaches could be used in designing a mobile application focussed on language learning. Some of the design principles that we have used in this application is outlined below.

2.1. Design for primary goals

Keeping the primary learning goals central throughout the design process, is key to the success of a language learning application. The specific learning goals that we aim to achieve in this application is four-fold:

Firstly, we aim to elicit actual spoken utterances from the student, as this step is crucial in gaining the necessary confidence in speaking a language as opposed to ‘theoretically’ speaking a language. Audible practice makes all the difference.

Secondly, allowing the student to audibly hear a target pronunciation of a specific word or phrase, encourages the verbalisation of the actual utterance when doubt or ill-confidence exist. Thirdly, displaying the graphemic representation of the word to be pronounced, connects the representation with the verbal pronunciation that will be spoken. Lastly, by requiring the association between a picture representing a word to be matched with the specific word, the semantic meaning of the word is linked to the graphemic and audible representation [2].

By purposefully aiming at these primary goals throughout the design and construction stages, various other inevitable design decisions are allowed much more flexibility, which aids in meeting all design criteria, and still ensures the overall outcome of the application.

2.2. Design for content independence

Developing effective mobile language learning applications is no trivial matter. With each application comes new challenges and new pitfalls—besides the cost of such development. By designing this application in such a way as to make the actual contents that needs to be mastered independent of the specific learning method, this mobile application could easily be deployed to teach a completely different language or a different curriculum without redesign.

2.3. Design for pedagogical support

The order in which material is to be mastered forms the heart of any pedagogical approach. As part of the design of a vocabulary training curriculum, a specific sequence of words, potentially with targeted phonemic content, will need to be mastered prior to progressing to a new set of words.

In order to accommodate such a specific work flow, the concept of a lesson is enforced within the application, while maintaining a certain degree of freedom within each lesson to stimulate dynamic learning and provide flexibility for performing tasks in a slightly different or-
der. The choice of first locating a word on the screen and subsequently looking for the matching picture, versus seeing a picture and finding the word that is associated with that picture, should be up to the personal preference of the student—in the same way as many would approach building puzzles differently.

Also, a process of elimination in matching the remaining words with the pictures is totally acceptable to aid the confidence of the student, as long as the overall milestones are reached prior to commencing to the next lesson.

2.4. Design for fun learning

Learning can be lots of fun. By not being overly prescriptive in how a task is completed, and by introducing subtle competitive metrics typically used in games, learning can be very stimulating. Using a time-based metric of completing each lesson combined with a quality metric that is loosely coupled to the pronunciation accuracy, the student can experience the excitement of playing a game whilst mastering certain aspects of a language at the same time.

In this way each student could approach the game in a different way, similar to how Angry Bird players approaches the game in different ways, focusing on accuracy or speed of completion, yet still achieving all the primary goals of the task.

2.5. Design for the developing world

Internet connectivity—at least during the key speech intensive stages of a mobile language learning game—is something that cannot be assumed for large parts of the developing world [3, 4], where the need is arguably the greatest for mastering English or other more localised languages.

With this application, the two major technologies, namely the Automatic Speech Recognition (ASR) and Text-to-speech (TTS) components, are running on the mobile device itself and does not depend on real-time Internet connectivity of any kind. For any back-end services such as performance tracking via a Learning Management System (LMS), a dependence on the Internet does exist, but such connectivity could be asynchronous [5, 6] and does not impact on the real-time learning experience of the student.

3. Demonstration

The demonstration of this mobile language learning application, employing off-line ASR and TTS technologies, will seek to exhibit some of these design aspects on an Android smartphone or tablet device.

4. References


