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Exposing Reflection on Accommodation and Assimilation in Mobile Language Learning

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ABSTRACT
MiniMandarinHowler is a mobile language learning tool for Mandarin designed to promote reflective accommodation and assimilation of vocabulary. Using an electronic dictionary interface to encourage usage, the program exposes the relations between different words to the user in a way that encourages mental links and differentiations between words, based on ideas from Constructivism and Connectivism. An evaluation approach is described to attempt to detect if reflection-in-action or on-action occurs while using mobile devices. Possible modifications are then discussed to enhance the reflective potential.

Author Keywords
Reflection, accommodation, assimilation, language, mobile.

INTRODUCTION

The *Howler Project* is an investigation into the use of user-interaction tracking with computer-assisted language learning (CALL) software for Mandarin, in order to automatically generate learning recommendations for those users. As part of this system, an Android-based mobile test-bed called *MiniMandarinHowler* (MMH) was developed for initial user feedback and to capture some data to help select likely useful algorithms for the main client software. The opportunity has arisen to develop MMH into a full-blown mobile language-learning program in order to evaluate reflective possibilities in mobile learning. MMH provides a simple electronic dictionary style interface to the user. They can view, sort, filter, create, and edit entries in their personal vocabulary database. Flashcard drilling and quizzing features are available. While using the program, the user's actions are being recorded. This data is exposed through a reflection interface that allows the user to see each item of vocabulary, and their own actions, in context. Work with this system is on-going. The motivation for, and design of, the system are given in the following section. The intended evaluation approach is then discussed and possible enhancements to the system are given in closing.

DESIGN

Background

Piaget's Constructivist processes of *accommodation* and *assimilation* (Piaget, 1983) suggest that individuals learn by incorporating new experiences within their existing mental framework. While this is an internal process, over the decades much research effort has gone into exploring ways to assist learners with it. The approach used by MMH is to expose the user to the interconnections between vocabulary items, and to statistical information about individual items. Explicitly showing items related by definition, pronunciation, lexical category, or orthography allows the learner to see an already-adapted framework that incorporates an individual item and serves as an example for the learner.

Connectivism is learning theory with the idea that knowledge is embodied in the web of associations between concepts, rather than necessarily in the concept itself (Siemens, 2004). This web of associations rather neatly maps onto the inter-relations between vocabulary items in a language. Meanings of words relate to their use in a language, and to the meanings of other words, therefore visualising their place according to word properties may provide a template for learning such associations.

Language learning has a particular desire to use authentic content in authentic settings (Duquette, 2007; Rogers 1998; Wong 2010). This situates the learning in the real world and makes its relevance more obvious to the learner. Mobile language learning has an obvious advantage here in allowing the use of mobile learning programs while actually in such a setting. They can consult existing items, add new items, and use the visualisation provided by MMH to expose related items which the learner would not have initially considered, while still within the situation in which they are relevant.

MMH Design

MiniMandarinHowler is an Android application with four major interfaces. A *list screen* lists, potentially sorted, all the items in the database matching the user's desired search filter. A *word screen* displays details about a selected word. The user can navigate between other words in the current filter by swiping the screen left or right. Individual details are interaction-sensitive and change the search filter to display words appropriately related to the detail interacted with (e.g., clicking on pronunciation returns other words with elements of that pronunciation). Figure 1 provides two screenshots of this screen. A *flashcard screen* provides drilling and testing on a user-defined subset of words. It can also be populated with pre-defined "pedagogically useful" subsets such most wrongly-guessed words, or words which are due to be tested according to a spaced-repetition scheme. Finally, a *reflection screen* exposes the inter-relations between words (see below).

The dominating user-interface principle was to allow the user to seamlessly and effortlessly navigate between vocabulary items without fear of being overwhelmed by the number of possibilities. The "back" facility in Android applications has been used to ensure the user can return to previous points by continually pressing "back". The interaction-sensitivity of each word property allows simple, fast, and casual exploration of related words.

Figure 1. (Left) Word view. (Centre) Interaction sensitivity explores related words from characters in the current word. (Right) Reflection view with current word in centre and related words on edges. Reason for relation is highlighted in white.

Reflective Screen Design

The design of the reflective screen was chosen to emphasise the connections between words and allow them to be fluidly traversed. The currently selected word dominates the display in the middle of the screen, showing some of the details available in the word screen. Surrounding the word around the edge of the screen are representations of related items. These are displayed as miniaturised, abridged views of what the item would look like if it were the currently selected one. The number of these related items is limited to one per corner, one per short edge, and two per long edge to allow separation for display and easy input in a phone form-factor. To switch to one of the related items the user swipes that representation into the middle of the screen. A screenshot of this screen can also be seen in Figure 1.

Items are selected for these edge spaces by being related by definition, pronunciation, lexical category, or orthography to the selected word. This is how the accommodation and assimilation process is exposed and scaffolded. User interaction data also has a large role to play in the selection of related items; words which the user views or edits often, or which have been recently added or edited, are given priority to be displayed in one of the limited number of screen spaces available. This is done in order to maximise the user's exposure to words he may not yet have fully adapted into his framework. The user also has the option of automatically populating a flashcard drill/quiz with the word and all its related counterparts.

Expected User Behaviour

The user is expected to primarily use the electronic dictionary functionality provided by the program. This provides the direct support to their language tasks that a physical dictionary would. For the learner to use the reflective interface they must first see a use for it. To encourage adoption it will be referred to using more end-user friendly phrasings such as "see related words". Therefore, the first few times the user encounters the interface they will have an idea of its purpose. Subsequently, the user will start to explore the network of connections out of curiosity, and thus be surreptitiously scaffolded to reflect. The form and extent of the reflection is entirely up to the user; the program offers no further

functionality beyond navigation and flashcard auto-population. This is in order to avoid distraction from the associations presented since they contain the implicit language knowledge that needs to be acquired.

EVALUATION

Evaluating reflection directly is difficult due to its internal and subjective nature (Schutz, 2004). While it is possible to evaluate how well a learner follows a reflective *procedure*, such a procedure is proscribed by the implementation of MMH. Instead, the usefulness of the reflection provided will be evaluated via correlations between usage of the feature and any proportionate increase in language ability, and by qualitative user focus groups. This aligns well which the participants of the study who will be informal, semi- or un-directed language learners who have differing levels of ability. Pre- and post-tests will be designed to measure their language ability and breadth of knowledge. While this evaluation strategy admittedly lacks the conclusiveness of more controlled approaches, it does allow the raw revelation of giving a pedagogically useful tool to learners then allowing them space to "see what happens" when they have it. Since the author is unaware of any existing mobile system focusing on provoking reflection in the proposed way, there are a large range of possibilities to capture. This high risk approach is also mitigated by the frequent availability of possible participants through-out the host universities language programs, and their general willingness to try new approaches to learning, and echoes the iterative prototyping approach of agile development methodologies in software engineering.

One particular line of investigation in the user focus groups will be to try to identify when reflection with a mobile device takes place. Schön wrote of *reflection-in-action* and *reflection-on-action* as the ad-hoc reflective, experimental practice during an event, and the more deliberate recapping and analysis after an event, respectively (Schön, 1983). The distinction between these is rather debatable. When does reflection stop being part of an event? And what of reflection on a previous event during a later event? Studying *use*-in-context is a basic part of mobile system research; this study will reveal if *reflection*-in-context occurs with mobile systems. The hypothesis is that very little reflection-in-action will occur but there will also be a very large deviation in the amount of reflection-on-action undertaken by different participants based on their learning approach. This is hindered, however by the likelihood of the study being conducted in an environment outside of the learner's target language, as discussed below.

DISCUSSION

As noted, this work is currently awaiting studies being performed and therefore has no concrete results to report. Initial user exposure however, has resulted in positive feedback on the potential usefulness of the system. In particular, users saw the use in the reflective aspect of the system without explicitly explaining its reflective nature to them.

An unresolved issue in evaluation is that of authentic contexts. Users of the system will not be located in an environment which uses their target language. Language situations are unlikely to arise outside of set-piece educational situations. This will markedly reduce the possibilities for authentic contexts for reflection. Currently, there is no available solution to this. However, should this work produce promising initial results, it will become possible to access exchange students who are immersed in their target language. Such a situation would dramatically improve the amount of data available.

The presented system is limited in its scope due to its initial purpose. The reflective view of word associations is split from the routine usage of the system in order to capture data about it. If users exhibit no problems with navigation in the reflective view then in the next iteration it will likely be used to completely replace the detail view of a word, continuously exposing reflective capability to the user. Rich mobile capabilities such as location tracking and image and sound capture are unused in this program. All three may allow vocabulary to be better situated in context. Finally, the full Howler Project, from which this program originates, combines interaction and vocabulary data from all users before data-mining to provide a collaboratively-derived framework for reflection. This was not included in MMH due to the complexities of doing so on a mobile device, however, should results indicate mobile reflection was useful it will become worthwhile to implement to discover if mobile group-reflection is useful.

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