

Maparin: Creating a Friendly and Adaptable Learning Scenario for Foreign Students in Taiwan

Wei-Tung TANG^{a*} & Shelley Shwu-Ching YOUNG^b

^aInstitute of Information Systems and Applications, National Tsing Hua University, Taiwan

^bInstitute of Learning Sciences, National Tsing Hua University, Taiwan

*scy@mx.nthu.edu.tw

Abstract: In this paper, we describe a mobile App called Maparin. It has been designed to facilitate foreign students enrolled in National Tsing Hua University (NTHU, Taiwan) while adapting to this Chinese speaking environment. Focused on providing complementary learning material in addition to regular Mandarin course training, the App leads foreign students to their desired restaurant to undertake Chinese learning and social interaction with locals in a real-life context. With the built-in GPS and Augmented Reality (AR) display, students equipped with iPad App have the ability to decide when and where to acquire essential Chinese language knowledge in informal settings. In addition, an embedded Automatic Speech Recognition (ASR) assessment system allows foreign students to learn the authentic pronunciation of daily meals in Taiwan. Moreover, a group of foreign students have been selected for system testing and evaluation. The experimental result shows that food ordering and campus restaurant locating via Maparin is much more efficient and satisfying for the foreign students.

Keywords: Social networking sites, augmented reality, mobile assisted language learning, ubiquitous learning

1. Introduction

For years, Taiwanese institutions have been marketing their curriculum to future international students. According to statistical reports on registered international students from Ministry of Education in Taiwan, the total student population increased from 55,463 to 78,261 (from 2011 to 2014).

Yet, it has been reported that most of the international students have experienced culture shock or had problem to adapt to a Chinese speaking environment in Taiwan or China (Paniagua 2009; Morataya 2012; Hu, Al-mekhlaf, Sun & Zheng, 2010). Most of the international students in Taiwan acquire

Chinese as a second or foreign language in a class setting. Therefore, the only language practice is done during class, which means students are not frequently exposed to the language and the people who use it on daily basis. Chinese is a difficult language to acquire due to its complex characters' shapes, multiple meaning and intonations (Tseng, Lu & Hsu, 2006). Thus, if students do not have enough language practices with peers or local students, the acquired knowledge from language training courses would likely to be forgotten.

Field trip is a popular alternative solution in addition to regular class (DeWitt & Storksdieck, 2008). This type of extracurricular activity helps students to discover things they have never experienced before such as night market and local cuisine. In this study, we discuss an implemented mobile App focusing on assisting overseas students especially for food purchase on or off campus, and how students can use it to their advantage. At the early stage of this research, we investigated what type of survival difficulties international students might have faced since arrival in Taiwan. Questionnaires were responded by 51 international students from 3 Mandarin classes of basic levels. 4 major complaints from students were identified and are listed as follows:

- Having little or no idea about where to get safe and healthy food for students with different religious beliefs.
- Having little or no desire to speak Mandarin in public due to poor Mandarin pronunciation performance.
- Most of local restaurants do not offer English menu.
- Having little or no idea about how to respond to restaurant owners on customizing their orders.

To address these problems, we implemented an iPad App named Maparin. It is integrated with Facebook social feature and Augmented Reality (AR) display, focusing on helping students to learn how to order food and customize their orders in an informal learning situation. With a couple of finger clicks, students are able to browse through the restaurant information within campus area.

2. Related Work

2.1 Acculturation

The process of one being transformed in a cultural or psychological way is called "Acculturation" (Sam 2010). *Integration, assimilation, separation* and *marginalization* are four possible strategies when individuals decide to maintain a balance between their heritage culture and alien culture (Berry, 1974). It is important to understand how international students in Taiwan would behave while dealing with this psychological (e.g., self-esteem) or socio-cultural (e.g., acquiring a new language) transition. The latter is vital to study because the way how students adapt to the new environment and language can and will be different. The transition experience varies individually. Difficulties stemming from language or culture differences may frustrate students, resulting in lack of interest in cultural maintenance or having no desire to develop relationship with others. Students who integrated with target culture usually tend to participate in the community, ultimately developing a sense of belonging.

On the other hand, those who find no interest in target culture and language will choose to maintain a distance from the community.

International students in Taiwan usually are not required to take Mandarin courses during their academic years. Yet, it is vital for those who are interested in Chinese or Taiwanese heritage and culture to achieve basic level of Mandarin. In order to be able to participate as a member of Taiwanese community, students will need to be trained before they can start communicating with the outside world. In this study, we work to provide better adaptation experience via mobile technology. To ensure a better learning experience and lower frustration that may ultimately lead to marginalization from the target language or culture is our top priority.

2.2 Chinese as a Foreign Language (CFL)

Learning Chinese as a foreign language is a great challenge because it has a total different syntactic structure, the lack of common roots in the vocabulary, five distinct lexical tones, 22 consonants initials and 38 vocalic finals (Tseng et al, 2007). For Chinese reading and speaking, Pinyin is widely practiced in most of the language institutions in Taiwan. Pinyin is an official phonetic system transcribing Chinese characters' pronunciation into Latin alphabet (Margaret& Charles, 2005), making CFL students easier to relate while attempting to acquire and pronounce a new vocabulary. However, using Pinyin alone may cause confusion by making false tone utterance. As we have mentioned above, there are five tones in Chinese language. Different tone utterance may yield different word of meaning, making native listener of Chinese confused while students attempt to express themselves in Chinese. Related study confirmed that single tone can be learned by CFL learners quickly. However, attempting to articulate a sequence of tones from any given reading text can be much more difficult (Mixdoff, Külls, Hussein, Shu, Guoping & Si, 2009).

For learners whose native language is non-tonal, tone utterance and identification pose a great difficulty to them (Wang, Jongman & Sereno, 2003). In Wang's previous study (Wang et al, 1999), it shows that training Americans to perceive Mandarin tones is proved to be effective. Participants received intensive Mandarin tone perception practice and identification. Result shows a 21% improvement in tone identification post-test, and such gains were retained even after 6 months. In their extended study (Wang et al, 2003) further states that improved perception in Mandarin tones also contributes to better tone production performance.

In this study, both pinyin and pronunciation demo audio are both included in order to provide a more precise tone perception practice for international students. Moreover, knowing how to pronounce in a correct tone will also help lowering students' speech anxiety.

2.3 Situated Learning

The basic idea of situated learning is that the learning process is a mutual interaction between the learners and their environment. Therefore, instead of being observers, learners take a step forward and

actively involves in the interactions with the community (Lave & Wenger, 1991). Smartphones and tablet PCs are equipped with advanced GPS and digital compass will certainly play a major role in situated learning. Learning that takes place outside of the classrooms can be greatly benefited by mobile devices in the following ways: wireless network empowers its users to fetch desired location information seamlessly, making learning content accessible anytime, anywhere. Well-designed Apps with appropriate learning content can be downloaded before the outdoor activities start, further enhancing learning experience.

Related projects also indicate that learning that takes place in the context of real life is a more applicable way of problem solving. A similar study called MicroMandarin adopts a location-based social networking service “Foursquare” to determine learners’ location and push corresponding Mandarin vocabulary flashcard for its users to undergo learning (Edge, Searle, Chiu, Zhao & Landay, 2011). In Beijing Normal University, an interesting AR based android App was implemented to facilitate campus culture events. Users were able to search for online information by simply clicking on icons on screen that represented desired location information on android based phone (Pei & Cai, 2013).

We have also reviewed several other interesting learning systems using various wireless technologies. It has come to our attention that there is only a small portion of studies that focus on CFL learners of Chinese in Taiwan, particularly targeting at foreign students. The Cross Platform Map System (CPMS) is a mobile application that offers a virtual map with English and Chinese information available (Paniagua, 2009). The mobile system was implemented to assist foreign students to learn and acquire Chinese characters. The results showed a notable improvement in students' ability to recognize characters that were presented in a campus environment. However, the experiments in the CPMS project were conducted under a pure laboratory environment. Foreign students simulated a self-guided tour by using the virtual map, resulting in a lack of interaction between students and native speakers of Taiwanese citizens. Another study that focused on creating an interactive learning environment for foreign students in a real-life context was presented to address the lacking of interaction between students and people who use Chinese as a spoken language in CPMS project (Morataya, 2012). In Morataya's study (2012), a mobile game-based learning system was presented, using riddles and score system to support CFL learning. Foreign students who participated in Morataya's study reported that they had great fun learning Chinese while doing quests around the designated campus building and places. Students also reported it was a great idea to engage Taiwanese citizen in real-life conversation in Chinese especially when they had a basic idea about the subject of the conversation would be.

Each of the similar learning projects has their own strength and weakness. MicroMandarin is an innovative one because of its unique location-aware mechanism. Being a vocabulary flashcard based learning application, it lacks of the interaction between users and the application by only providing static pictures for each scenario. CPMS is an excellent location information indicator which supports bilingual learning scenario. Unfortunately, the study did not engage its subjects in the physical learning environment. In Morataya's study, we have seen that a great game-based learning

design can help its learners to immerse in any possible environment and actually acquire knowledge. However, the majority of Morataya's participants reported that 3G wireless network coverage was unstable and campus WIFI transferring between each building also made it less user-friendly while doing quests from one location to another. In addition to network issue, one concern was made aware by the majority of participants who complained about getting lost while doing quests because the mobile system did not provide a real-time location update as they travelled between buildings. Finally, there was no text-to-speech (TTS) function or audio file available for students to imitate from. Thus, students could only depend on Pinyin to learn how to pronounce recently acquired Chinese characters, resulting in mispronunciations and confusions while initiating conversations with the locals.

To address the problems mentioned in this section, the proposed system takes advantage of mobile devices and an advanced 4G network to allow students to access crucial learning content in real-time. An embedded Automatic Speech Recognition (ASR) module is included in the proposed system, allowing students to check their speaking performance before making contact with the locals. Chinese vocabulary and conversations that are made available in audio form (MP3 file) were pre-recorded by a native speaker, allowing students to imitate authentic pronunciation.

All in all, the proposed system made several attempts to enhance learning experience and promote students to fully engage in the learning content of this study. The learning scenario set for this study is about a group of international students who are tired of ordering the same food they can recognize. By using the location finding technologies such as Facebook check-in, AR display and Google Map, they are able to go on a self-guided food hunting in Taiwan. Most important of all, the proposed system empowers them to initiate basic daily conversations with Taiwanese locals.

3. System Implementation

3.1 System Architecture

This system is built based on client-server architecture. On client side, an App is implemented on iPad. The App is connected to remote data server. Most of the information related to local restaurant, food item information and pronunciation demo audio file are stored on the remote sever. It means wireless network is required to launch the App for data request and transmission between two components. The system architecture is shown in [Figure 1](#).

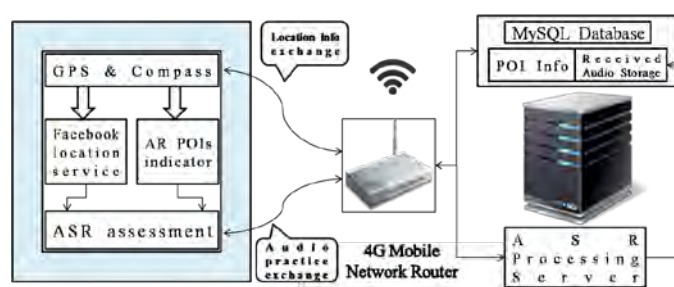


Figure 1. System Architecture.

3.2 Mobile App

The design of this mobile application consists of 3 major features:

- Integration with Facebook social feature, making social connection possible.
- An Augmented Reality (AR) based location indicator.
- An ASR assessment system, allowing international students to practice how to make food order in Chinese.

The App requires its users to login via Facebook accounts. As shown in Figure 2a, an AR display serves as one of the location finding options for learners who feel like to scan what type of restaurants are around them. The second option contains a map, which reveals user's current location. The flickering blue dot indicates user's exact geography location (shown in Figure 2b). Three pre-defined search filters has been deployed to assist students to perform check-in from Facebook database. When selecting any of the filters, the system will perform a nearby location check to determine learners' nearby restaurant information. Students then will be able to select the local restaurants in the neighborhood to start acquiring Taiwanese food items and practice how to pronounce them via ASR assessment.

The mobile App is implemented with various web development techniques and Apple iOS development SDK 6.0. On the client side, mobile App is developed using Xcode. Facebook SDK 3.0 and ARtoolkit are integrated during implementation. On the server side, (JSON) and SQL database are deployed to serve as data center. JSON is used to bridge the communication between iPad and the SQL database. Additional Hypertext Preprocessor (PHP) pages are also scripted for data exchanging between mobile App and Apache server. The speech recognition also plays a crucial part in this project. The ASR toolbox is designed by Professor Jyh-Shiung Roger Jang (National Taiwan University, Taiwan). Upon receiving learners' recorded audio file, it will be sent back to the remote server for further performance evaluation. The pronunciation performance is rated on a scale of 100.

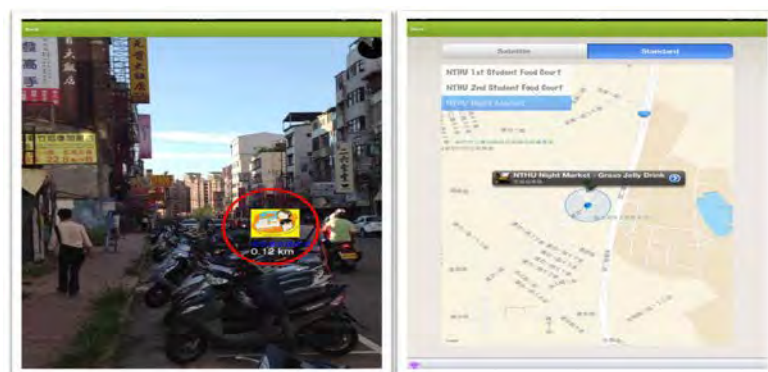


Figure 2. App Snapshots –
(a)AR display Mode (b) Facebook Check-in Mode

4. Evaluation

4.1 Test Design

4.1.1 Participants

29 international students from a variety of departments of NTHU participated and completed the evaluation (graduate level, business and engineering background). The students were of age 22 to 30. 11 of the participants are female and 18 are male. Their average time spent in Taiwan is 12 months, ranging from 6 months to 18 months.

4.1.2 Procedure

The entire evaluation session lasted 2.5 hours. The session included a pretest, a usability test, a post-test and an individual interview.

In the pretest, we measured the participants' Chinese speaking ability by using the mobile App's embedded ASR assessment tool. Questions were generated with a combination of Taiwanese food item names and sentences of standard way of food ordering in Chinese. The test was validated by an official Mandarin teacher from Chinese language center of NTHU. In addition, the pretest was taken by 5 of Taiwanese native speakers previously. The average score obtained from native speakers was 85 (on a scale of 100). The participants were given instructions on how to use the mobile App. They were given an hour to play with the App and browse through the nearby restaurants and the food items. During this hour, they were also required to make practices with ASR assessment every time they viewed a different restaurant.

Once the required App trial and practices were completed, a field trip was deployed to observe if the participants were able to reach restaurants in a nearby night market by using the App. There are approximately 20-25 restaurants including small sized food stands, which only offer take-out service. The subjects were not made aware of the exact location on the ones they were going to visit. At this time, the subjects were equipped with one iPad each person. Upon reaching the selected restaurants, the subjects were required to salute the owners and make the orders in Chinese. Each of them was required to visit 3 different restaurants (10 restaurants were available in the mobile App).

4.2 Results and Feedbacks

The learning achievement result is processed by comparing the score generated from pretest and post-test (shown in [Table 1](#)). During the pre-test, the score distribution is not consistent (lowest score = 31.5, highest score = 74.5). The majority of the subjects obtained score between 50 to 65, indicating that the students' attempts to pronounce Chinese food item names and short sentence using Pinyin alone was not effective and they did make several false tone utterances. In the post-test, however, there is a significant improvement in pronunciation (lowest score = 66, highest score = 87).

Table 1: Pronunciation achievement test result

Test type	N	Lowest score	Highest score	Mean(full scores)	SD
Pretest	29	31.5	74.5	59.96 (100)	10.36
Post-test	29	66	87	73.75 (100)	05.54

The result confirmed and supported the idea of consistent Mandarin tone perceptual practice will make CFL learners to achieve better performance in tone production since ASR assessment system generated personal score based on subjects' tone accuracy and intonation. The input made by the subjects needed to be matched with the corresponding food item name in Chinese before being sent to remote server for assessment. False and inappropriate input will be detected and denied.

For the field trip, all of the subjects were able to locate their desired restaurants or food stands out of night market within 15 to 20 minutes. Please note that restaurant locating and food ordering was undertaken by the subjects themselves. No hints were given during the entire field trip. The subjects reported that AR location indicator helped much when they could not locate the destination using embedded Google map and Facebook check-in. If they were not sure to go right or left, they would switch to AR display to decide which way to take. As for the restaurants visit and food order, subjects reported that it was a wonderful experience to literally initiate conversation with Taiwanese in Chinese. All of the subjects were able to complete the order after using the App. 83% (24) of the participants found it extremely interesting and useful when they succeeded in making orders in Chinese. They expressed that this type of experience is unforgettable and influential for their future encounters in Taiwan.

5. Conclusion and Future Work

In this study, a novel campus restaurant information system for Chinese pronunciation practice and restaurant finder has been designed and implemented. The proposed system engaged its participants in a real-life context, enabling them to participate the society as a normal Taiwanese citizen would do on daily basis. With the advanced mobile technology and wireless network, the proposed system effectively supported its users to reach their desired restaurants and facilitated their social interaction with locals, providing a smooth and friendly user experience.

Yet, to continuously improve the mobile App, there are several factors which have to be taken into consideration in its subsequent study. First of all, social collaboration capability has to be expanded. Participants reported that the ability to allow its users to upload their preferred point of interests should be made available if one wishes to share any recent spotted restaurant. Secondly, offline mode should be made available if one wishes to practice with ASR system. Currently, ASR assessment and pronunciation audio file can only be accessed via internet. Finally, more dialogues should be made available because restaurants owners sometimes ask more questions about their orders and the App does not have the solution to respond yet.

References

- Al-Mekhlafi, K, Hu, X. &Zheng, Z. (2009). An Approach to Context-Aware Mobile Chinese Language Learning for Foreign Students. *Mobile Business*, 340–346
- Berry, J.W. (1974). Psychological aspects of cultural pluralism. *Culture Learning*, 2, 17-22.
- DeWitt, J., &Storksdieck, M. (2008). A Short Review of School Field Trips: Key Findings from the Past and Implications for the Future. *Visitor Studies*, 11(2), 181–197.
- Edge, D., Searle, E., Chiu, K., Zhao, J., Landay, J.A.(2011):MicroMandarin: Mobile Language Learning in Context. In: Proc. of CHI 2011, pp. 3169–3178. ACM.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge university press.
- Margaret, S.J.,&Charles, H. (2005). *The science of reading: a handbook*. Blackwell handbooks of developmental psychology) 17. Wiley-Blackwell. pp. 320–22. ISBN 1-4051-1488-6.
- Mixdorff, H.,Külls, D., Hussein, H.,Shu, G., Guoping, H., Si, W. (2010).:Towards a Computer-aided Pronunciation Training System for German Learners of Mandarin - Prosodic Analysis. In: L2WS-2010, Tokyo
- Morataya, S. (2012).A study of the mobile game-based system to support the Chinese speaking language and motivation of international students. Master Thesis. National Tsing Hua University, Hsinchu, Taiwan.
- Paniagua, Y. (2009). A cross platform map system (CPMS) to facilitate adaptation and language learning for international students in a Chinese-speaking environment. Master Thesis. National Tsing Hua University, Hsinchu, Taiwan.
- Pei, L,S., Cai, S. (2013). Mobile Campus Touring System based on AR and GPS: a Case Study of Campus Cultural Activity. *Proceedings of the 21st International Conference on Computers in Education*. Indonesia: Asia-Pacific Society for Computers in Education.
- Sam D. L. and Berry J. W. (2010) Acculturation – When Individuals and Groups of Different Cultural Backgrounds Meet. *Perspectives on Psychological Science July 2010 vol. 5 no. 4* pp.472-481
- Tseng, C.-C., Lu, C.-H., & Hsu, W.-L. (2007). A mobile environment for Chinese language learning .In M. Smith & G. Salvendy (Eds.), *Human Interface and the Management of Information. Interacting in Information Environments* (Vol. 4558, pp. 485-489): Springer Berlin / Heidelberg.
- Wang, Y., Spence, M. M., Jongman, A., and Sereno, J. A. (1999). “Training American listeners to perceive Mandarin tones,” *J. Acoust. Soc. Am.* 106,3649–3658.
- Wang, Y., Jongman, A., &Sereno, J. (2003). Acoustic and perceptual evaluation of Mandarin tone productions before and after perceptual training. *Journal of the Acoustical Society of America*, 113 (2003), pp. 1033–1043