Multimedia Mobile Language Translation Tool

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Abstract-Existing mobile language learning tools are web-based and subject to connectivity disturbance that ensue in restricted use. The lack of research in the implementation of mobile language learning has ignited the motivation for this study. The proposed Multimedia Mobile Language Translation tool (MMLT), incorporating various multimedia elements such as image, video, sound and text to provide alternatives for translation and subsequently increase the learners’ linguist system and encourage further learning. In addition, MMLT was examined with heuristic to ensure effective learning. MMLT is a value added mobile application designed for ease of use and minimise the efforts and time consumed to language learners.

I. INTRODUCTION

A. Mobile language learning

Language learning regardless of primary language or secondary language acquisition was previously confined to the conduct within the classroom. While this method is effective, it requires intense labour resources as a trained teacher must be presented to impart the knowledge to the students. Furthermore, students from remote areas where qualified foreign language educators are truly scarce would have to commute to the neighbouring town or city for language learning. The static classroom form of education entails a fixed schedule where the students and teacher would agree upon the venue and time for learning, directly eliminate the notion of mobility.

The advent of computing technology, specifically on networking, has changed the traditional conduct of education. The term, computer assisted language learning or CALL has been coined on numerous studies [1][2][3] to support and investigate the effectiveness of language learning via computer. CALL utilises the multimedia elements such as text, graphic, video, audio and animation to attract, assist and engage students into the language learning process. The effectiveness of CALL vis-à-vis the lack of knowledge in the domain of educational principles by technical developer of CALL has been attributed as the cause of failure in certain CALL applications [2].

Inhibition of students to participate in discussions which are a usual demeanour in the class is reduced when the discussions are carried out in the virtual space [4]. Students could actively take part in the discussions without the teacher as the acting mediator to promote interaction. In addition, certain CALL applications are self contained as artificial intelligence is employed to construct the presence of a language expert and consequently eradicate the need for human linguist [5].

Mobile computing is increasingly pervasive in our daily life as it could be evidently seen through the widely used mobile phones and other mobile devices. Many applications in the field of communication, commerce and content have adopted mobile technology as it promises the usage of anywhere and anytime. In the light of such beneficial offering by mobile technology, a new deployment of language learning on the mobile platform has immersed. Nonetheless, only a handful of studies have been conducted [6][7] in the arena of mobile language learning.

B. Second language acquisition model

Prior to the assessment on the effectiveness of mobile language learning, sound understanding on the process of language acquisition should be developed. Figure 1 depicts the basic components in the second language acquisition (SLA) in interactionist research.

![Fig. 1. Basic components in the SLA process in interactionist research.](image)

Extracted and modified from “Multimedia CALL: Lessons to be learned from research on instructed SLA” [1]

The learning curve starts with the presence or availability of the target language which is denoted as “Input”. Among the abundant information that is presented to the student, not all has the equal potential to be acquired. Particular input that is apperceived or noticed by the students have the opportunity to be attained. Subsequently, the apperceived input would undergo the comprehension phase whereby the semantic of the input would be understood with or without the knowledge on the syntactic structure of the input. Conversely, syntactic knowledge could be obtained through the identification of lexical items and interpretation of non-linguistic cues in the input.

Comprehension of both semantic and syntactic structures of the input consequently transform into the form of intake which is the comprehended input that could enhance the linguistic knowledge of the students. Integration is a process in which intake is combined with the existing knowledge on the target language as well as usage of the newly acquired knowledge which directly enhances the development of the linguistic system. Finally, the output is the observable outcome of the process which might act as input for subsequently learning.

The notion of “negotiation of meaning” is a phenomenon whereby the SLA process forms a continuous cycle with the output from one process present as input on the next. For example, if a student...
spotted a grammatical error on the output and subsequently sought further clarification on the error, which became input to the next SLA process, the “negotiation of meaning” is carried out. Thus, “negotiation of meaning” plays a vital role in the development of language learning for a student.

C. Heuristic for the development of multimedia CALL

The frequently quoted seven hypotheses for the development of multimedia CALL proposed by Carol Chapelle [1][22] have outlined key heuristics for successful and effective language learning tool. The design of the proposed mobile language learning and translation application could fulfil all the guidelines and would discuss each in turn.

1) Specifies the need to make linguistic characteristic of target language salient to students.

2) Outlines the requirement to assist in the comprehension of semantic and syntactic structure of the language.

3) Implies the need to assist in the production of comprehensible target language output.

4) Underlines the need to recognise the error in target language output.

5) Specifies the affordance to correct the erroneous output.

6) Emphasis on the condition to facilitate in the engagement of target language interaction whose structure could be amended.

7) Stresses on engaging the user in interactive language learning task

D. Why mobile language learning?

The main attraction to mobile language learning is the characteristic of the mobile environment, particularly, as expressed by the over used propagation of “access anywhere, anytime” [8]. Hence, the learning activity could occur without spatial and temporal restriction and directly enforce convenience into mobile language learning. The benefit of convenience could be illustrated by an example in which the statement on the advertising billboard in railway station could be comprehended by novice students through the usage of mobile language learning tool.

Moreover, individuals with tight schedule who could not afford attending language classes could benefit from mobile language learning application. In the effort to stress on this advantage, a scenario has been presented. An officer stationed in the information counter of an international airport, for example, would liaise with foreigners who only speak their native language which is not known to the officer. To around the clock job of nature would hinder the officer to enrol in foreign language classes. In this case, a multimodal mobile language learning and translation application would be handy to facilitate the officer in the understanding of foreign languages and consequently result in smoother communication and increased quality of service.

Usage of the mobile language learning and translation application could be categorised into 3 forms namely, non-interactional, interactional with context and interactional with other interactants. Non-interactional indicate usage pattern in which external factors such as the environment and other individuals do not contribute to the input and output of the learning curve. Interactional with context signify a situation in which the surrounding environment encourage language learning such as the example of the advertising billboard described. Finally, interactional with other interactants is a condition where the user utilise the application to interact with other individuals such as the case of the information officer. The nature of the proposed mobile language learning and translation tool is conducted, as illustrated through the three categorisations, provides an active learning platform which facilitates cognitive learning.

E. Problems

The lack of research in the arena of mobile language learning is the primary motivation that ignites the quest to design the proposed application. Existing mobile language learning applications are web-based and require high quality of network connectivity to allow smooth usage of the services. In the light of this complication, an alternative that does not require static and constant network connection is prompt to be explored.

Mobile phones are increasingly pervasive as a personal necessity in a modern society and have established an unshakeable status in our daily life [23]. This is evident through the perception of the equal status between the mobile phone and the wallet where an owner always carry both the items around. Indirectly, mobile language learning tool is more accessible vis-à-vis stationary language learning tool due to the availability. Subsequently, the facility of mobility and accessibility will encourage the language learning tool to achieve a higher usage.

A usability comparison between the usages of web-based language learning tool regardless to the stationary or mobile nature to that of mobile non-web language learning tool unveils the advantages of the latter. For example, the effort involves in booting a stationary computer, connecting to the Internet, launching the web browser, entering the target URL and specifying the learning methods or courses is significantly higher than that of a mobile language learning application which involves only launching the application and stating the learning methods. The advantage of mobile non-web application is attributed to the affordance to specifically design the application to perform at its best to attain ease of use. In the effort to realise the notion of mobile non-web language learning application, Multimedia Messaging Service (MMS) and Short Messaging Service (SMS) have been employed to be the underlying communications protocol in this study. Therefore, the aims of this paper have been formulated as to:

1) Propose a non-web mobile language learning and translation tool that is independent from the constant and static network connectivity.
2) Design the prototype based on the seven heuristics of Multimedia CALL to facilitate effective learning.

3) Support and manipulate the multimedia elements, text, graphic, audio, video and sound as input and output of the prototype.

II. LITERATURE REVIEW

Nielsen has carried out a comprehensive study to research and propose an effective guideline for developing the content of CALL application [2]. The proposition is made based on two basic educational elements, text, graphic, audio, video and sound as theories, namely cognitive learning and behavioural learning. This research, however, does not details the implementation platform or technology that is employed and merely suggested educational contents such as introduction, theory sections, examples, exercises, self-test and help which are very common in learning programs.

Dolan has proposed a web-based language learning application to reduce human linguist in the language learning process [9]. The application suggested is not radically new in terms of features as it only employs various multimedia elements and existing Internet functions to interact with the system. Among the features provided are voice chat for peer support, facilitator support, forms and workshops, references material such as dictionaries, encyclopaedias, thesauruses and so forth.

Massaro has conducted an in-depth research on an animated electronic language tutor to assist hearing and speaking impaired students for accurate pronunciation [5]. The tutor is a three dimensional animated head that has a closed up tongue to visually assist pronunciation, recognition and language learning process. This application is very effective in educating students particularly, challenged individuals for correct pronunciation.

There has been little research on the mobile language learning application. Collins has carried out an extensive research in terms of breath and not depth on mobile language learning with mobile phones [6]. The research outcomes include details on the possible content creation system to employ, range of language learning tool to opt and numerous interactive features to include. The research work is significantly for the content developer. Nevertheless, the feasibility study and effectiveness of each proposed method for language learning are not evaluated.

Shih has provided a technical insight to the implementation of mobile language learning application [7]. The study has outlined the feasibility for implementing such system as the bandwidth and the data rates are taken into consideration for the web-based solution. MClass, the web-based application, relies on the backend database for processing to lessen the load on the mobile devices. As MClass requires constant connectivity for communication with the servers, MClass is subjected to connectivity disturbances due to the weather condition and the usage location.

III. IMPLEMENTATION TECHNOLOGY AND PLATFORM

Mobile application entail hybrid of hardware and technologies to provide functionalities to the target user. Prior to the design of the proposed model, elements, devices and the technology which is built upon is briefly examined. Multimedia is an integration of elements such as text, audio, video, images and animations [10]. Hence, machine that support and afford capability to process and produce these effects are termed as multimedia devices.

Portability is the salient characteristic of mobile devices that contributes to its vast acceptance and usage. Specifically, this attribute delineates the ability of the devices to be utilised and function in a moving environment. Mobile devices are categorised into the following genre: mobile phone, tablet personal computer (tablet PC), smart phone, personal digital assistant (PDA or Pocket PC) and laptop computer. Generally, most of these devices are incorporated or suggested to be integrated such as the pocket electronic dictionary [11] to the wireless technologies.

Despite the advantages to comply with a standard Third Generation (3G) protocol, Universal Mobile Telecommunications System (UMTS), Freedom of Mobile Multimedia Access (FOMA), Code Division Multiple Access 2000 (CDMA2000) and Time Division Synchronous Code Division Multiple Access (TD-SCDMA) are the 4 available 3G standards to date; each differs in the transfer rate and the operating countries. The transfer rate of 3G at approximately 144 Kbps to 3Mbps is significantly higher than Second Generation (2G) technology at 9.6 Kbps to 28.8 Kbps.

This advancement in the transfer rate facilitate the development of multimedia technology in the realm of mobile devices as large multimedia files such as videos and pictures could be seamlessly exchanged.

IV. PROPOSED MULTIMEDIA MOBILE LANGUAGE TRANSLATION (MMLT) TOOL

MMLT model enhances language learning and translation by applying wireless and multimedia technologies. The aim of MMLT is to provide a fundamental model that a learner could learn languages in a daily life. We designed the preliminary user interfaces of the mobile prototype and provided useful suggestions to promote the model.

A. Basic setup and infrastructures

MMLT’s architecture should encompass two main actors: the learner and the knowledge provider. Each actor is recommended to utilise the 3G wireless technologies to communicate as it guarantees high transmission rate for large multimedia data exchange. The knowledge providers and learners are required to connect to Multimedia Messaging Service Centre (MMSC) upon installation of the MMLT prototype. MMSC is the MMC centre to store questions from learners and attempt to forward to MMLT server with specified address or phone number. Subsequently, the server passes the questions which are directed to the knowledge providers for reply. See Figure 2.
V. FINDINGS, RESULTS, AND DISCUSSIONS

MMLT prototype is incorporated with multimedia elements (images, video, audio and text) to alleviate the language learning process.

A. Incorporating multimedia elements in MMLT

Mobile phones with camera and speech synthesis technologies facilitate MMLT to capture or record:

1) Still images/photos in the form of symbols, patterns and objects,
2) Video clips inclusive of video of sign language,
3) Audio and speech and
4) Text

A captured element is sent to the knowledge providers via MMLT prototype for interpretation into the selected target language such as French.

B. MMLT prototype and results

Figure 3 illustrates the main menu of MMLT prototype where the learners could select the desired options listed. For example, the ‘Capture Image and Learn’ option automatically activates the camera for images capturing unlike in web-based application where it requires to capture, store, browse the selected images and upload it to the server. The beauty of this feature certainly eliminates unnecessary effort and time. Whereas the “Record Video and Learn” option supports sequence of video clips and sign language. Theoretically, this feature mediates between the disabled community (auditory impairment – deaf and hard of hearing) and hearing community for better communications. For the “Record Sound and Learn” option, learners could record speech or music for interpretation. Moreover, the prototype offers “Write Text and Learn” preference. The text writing proposed to bridge the gap between erroneous semantic and syntactic structures in the same targeted language or among different languages. The interpretation process includes translation of the multimedia elements into intelligible target language which is selected by the learners. Figure 4 depicts the four main functionalities offered by MMLT prototype. Whilst, the results are shown in Figure 5 in the same order.
C. MMLT prototype and heuristics for multimedia CALL

The objective of the seven heuristics for developing multimedia CALL is to afford an ideal condition for SLA. Hence, by adhering and applying the heuristics to the design of MMLT, we safely believe that effective language learning could be attained through MMLT. The implementation of the heuristics to MMLT is evident and is discussed with the assistance of the prototype’s snapshot.

The first heuristic is achieved by highlighting or manipulating learner’s attention to notice certain semantic or syntactic structure of the target language for active learning such as described in the apperception in the SLA process. For instance, the result for “Write Text and Learn” option in Figure 5 highlights the word “you” which could be translated into different synonym of “vous” such as “tu” which both carries the same meaning in French. In the case where the learners understand the word “tu”, the introduction of “vous” in a highlighted form grasps their attention and subsequently instigates active learning.

Elaboration or simplification such as the representation of elements in various structures for explanatory purposes could be employed to accomplish the second heuristic. Figure 6 demonstrates the implementation of this heuristic whereby the translation is presented in different structures that bear the same meaning in French. In the case where the learners understand the word “tu”, the introduction of “vous” in a highlighted form grasps their attention and subsequently instigates active learning.

MMLT is designed to allow viewing of the content prior to sending for translation. In the event that content is incorrect and has to be edited, learners could easily do so by selecting the edit option. The ability to correct the linguistic input fulfills the fifth heuristic. The sixth heuristic could be satisfied through the engagement of interaction by the learners with MMLT for negotiation of meaning. For example, upon being prompted for the wrong syntactic structure and suggested with the correct input, learners could apply the newly acquired syntactic knowledge.
on the next input and completes the cycle of the negotiation of meaning.

The nature in which MMLT is utilised in an interactive context accomplishes the last heuristic. Contrary to most language learning tool which offers structured modules for learning, MMLT is a translation tool which usage is often impromptu as it depends on the surrounding context. The perception from and interaction with the context for specific purposes encourage continuous language learning.

VI. CONCLUSIONS

The proposed model has added value to learners in various means. The MMLT prototype has the ability to learn and translate language in anywhere and anytime, engage learners in interactive learning via the use of multimedia elements to promote learners' retention level and increase the learning curve. Furthermore, the prototype translates entire phrases or sentence as compared to word by word translation which might not be accurate. Research results exemplify that MMLT assist in the communication between the disabled and hearing communities by recording the sign language. It eradicates communication barriers and fears of travellers when approaching foreign countries.

VII. RECOMMENDATIONS

The major complication of the prototype lies in the cost and expertise of the knowledge providers. Such constraint could be eliminated by replacing it with automated Artificial Intelligence (AI) programs. The current AI techniques do not suffice as computer language translation is far from perfection. Thus, practical approaches and efficient experimentations are required to measure the accuracy and the effectiveness use of the language translation process.

REFERENCES