LOCH: Supporting Informal Language Learning Outside the Classroom with Handhelds

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Abstract

The continuous development of wireless and mobile technologies has allowed the creation of an additional platform for supporting learning, one that can be embedded in the same physical space in which the learning is taking place. This paper describes a computer supported ubiquitous learning environment for language learning, called LOCH (Language-learning Outside the Classroom with Handhelds). In the environment, the teacher assigns field activities to the students, who go around the town to fulfill them and share their individual experiences. The main aim of this project, called One Day Trip with PDA (Personal Digital Assistant), was to integrate the knowledge acquired in the classroom and the real needs of the students in their daily life.

1. Introduction

Ubiquitous computing [1] will help in the organization and mediation of social interactions wherever and whenever these situations might occur [9]. Its evolution has been accelerated by continuous technological improvements, and with those newly available technologies an individual learning environment can now be embedded in daily real life [13]. Mobile devices have become broadly available, opening an additional platform for supporting learning. More specifically, wireless mobile learning devices offer stunning technical capabilities for the development of new systems, because of their portability and low cost [14].

A detailed description of our endeavor to support the main characteristics of ubiquitous learning [3, 4] by using these novel advancements; is presented as follows:

Permanency: Learning processes are recorded continuously and stored, along with the work of the learners, in a centralized server. These records keep the teacher aware of the progress of each student, and can be reviewed later by the group to share their different approaches.

Accessibility: By using a PHS (Personal Handy System), learners have access to their data, videos, or recordings from anywhere. Information is provided based on their requests, therefore the learning involved can be considered self-directed.

Immediacy: Wherever learners are, they can get any information immediately to help them solve their problems. Otherwise, the learner can use his/her handheld to record the questions and look for the answer later, or ignite a discussion with other learners that found the same kind of difficulties.

Interactivity: Learners can interact with teachers or peers in the form of synchronous or asynchronous communication. Handhelds allow the usage of instant messaging and IP phones; hence, the experts are more reachable and the knowledge becomes more available.

Situating of instructional activities: The problems encountered, and the knowledge required to solve them, are all presented in their natural and authentic forms. This helps students to notice the features of problem situations that make particular actions relevant.

Computer supported ubiquitous learning (CSUL) provides a fine platform for promoting different learning theories, like hands-on or minds-on learning, situated and authentic learning [11, 12], which praise the importance of actual first-hand experience with the objects and/or situations to be learned and define the learner as a “cognitive apprentice” [3]. According to Ann Carlson, the process of authentic learning is learner centered, active and takes place around real world situations (situated) [6]. Other authors have underlined that when language is contextualized, speech is used productively, background knowledge is exploited, and the

language thinking pattern is assimilated [8]. Notice for example, the vocabulary teaching experiment by Milder and Gildea [10], in which they describe how children acquire vocabulary faster with the method used outside the school, by relating words to ordinary conversation, than with the traditional method based upon abstract definitions and sentences taken from external contexts.

In this paper we would like to present our efforts to integrate ubiquitous computing technologies and devices, in order to create a language learning environment based on field tasks. The application domain, design, implementation, targeted users and preliminary evaluation of the system are described in the following sections of this paper.

2. Proposed system

LOCH was conceived to assist overseas students to learn Japanese while involved in real life situations. Using the provided interfaces, the teacher assigns tasks to the students to go around the town, interact with native speakers and bring back their findings and/or questions.

Students can make use of their PDAs for writing down annotations, recording questions, taking pictures and reporting back to the teacher. At anytime, the teacher is monitoring the position of the students and can establish communication with them, either through instant messaging or IP phone, both preinstalled on the PDA (figure 1). The teacher guides the students through the task activities, giving suggestions or hints (such as “Ask somebody how to get there” or “You have to find the post office first”).

Figure 1: Students location interface

After all the students conclude their tasks, they meet together at the classroom, which is equipped with a smart board and where the teacher has being following their advances. All the gathered information is displayed and discussed, and each student explains his/her strategies to the rest of the group. Similar situations are identified, and their solutions are shared under the guidance of the teacher.

Certainly, this approach contributes with a better insight of the foreign students during their daily life in Japan. There are a myriad of expressions that students are unfamiliar with, and the purpose of the teacher is to give them the tools to respond and behave according to the situation. Furthermore, students are encouraged to go around because the usage of mobile devices seems new and interesting, and they have the assurance that the teacher can be immediately reached in case something goes wrong.

Although this system is currently being used for Japanese language learning, its interface supports several languages (English, Japanese, Spanish, and Chinese) and more can be easily added.

2.1 Design and implementation

We have designed the system as a central server, with two user interfaces (one for the teacher and one for the students) that grant access to their respective functionalities (Figure 2).

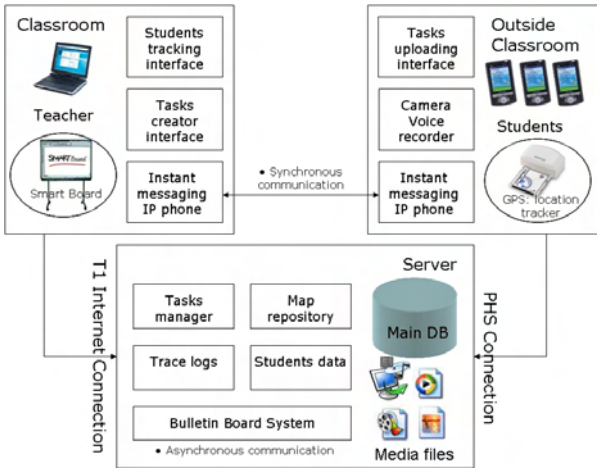

Figure 2: Architecture of the system

The central server has a repository of the student’s information, tasks provided by other teachers, and data gathered outside the classroom. The user interfaces are web-based because of the flexibility that this implies, any mobile device can access the system as long as it counts with internet connectivity and a web browser with basic capabilities. The size of the pages can be scaled accordingly to the size of the device’s display without interfering with the business logic of the system.

Relying on the premise that the lack of standardization in relation to platform, software and communication techniques available in mobile or wireless devices is inherent to the variety and rapid development of new technologies, we aimed to design a system that could be as accessible as possible, even when programmed in different languages or running over different platforms. Thus, the information is exchanged between modules using XML (Extensible Markup Language), because is a flexible text format that has been widely accepted as a standard for the exchange of data [2].

In addition, we use SOAP (Simple Object Access Protocol) as communication protocol, since it is founded upon XML technologies, and intended for data exchange over several underlying protocols, independently of the programming model and other specific semantics [7].

The system was implemented using Java programming language and following the J2EE (Java 2 Platform, Enterprise Edition) specification, which supports the development of reusable components as well as the integrated data exchange using XML-based open standards and protocols. The restrictions of the currently available Java virtual machines for mobile devices, however, compelled us to implement the module for delivering the position of the student, from the PDA to the server, with Embedded Visual C++ 3.0.

Figure 3: PDA, GPS and PHS technology

The prototype system was developed for PDAs (Toshiba Genio-e) with Pocket PC 2002, GPS (Global Positioning System), and PHS (Personal Handy System). We chose to use PHS technology due to the availability of a one year unlimited service program, that has the same cost regardless the amount of time that the devices are connected to the internet, or the size of the packages sent and received. This will give us enough time for experimenting with the system several times. Likewise, the PHS has a faster connection speed (112 Kbps) and a much lower battery consumption than WiFi (Wireless Fidelity) enabled connections (around 10 Kbps). Cellular phones were not used for this research, due to the fact that the resulting usage fees can not be absorbed by the University, which would imply that the students have to pay for their own expenses (figure 3).

3. Experimentation

We arranged a preliminary experimentation of the system with 7 users (2 women and 5 men, between 20 and 35 years old), all of them overseas students enrolled in the Japanese language intensive course at the University of Tokushima. The students (from Korea, Bangladesh, China, Peru, Philippines and Thailand) had different levels of expertise in the use of computer devices. Besides the students, 2 teachers of this course were directly involved during the development and experimentation phases of the project.

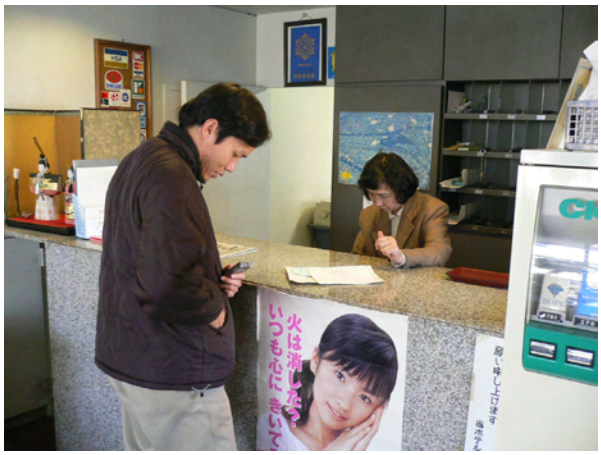

Figure 4: Scene of experimentation

Since the students were not familiar with the use of PDAs, we organized a hands-on session one week before the one day trip, and distributed the devices and the usage manuals for them to get acquainted with. Subsequently the teachers scheduled the tasks for the students, which include such activities as: “Go to the touristic information stand in Tokushima JR Station, and enquire about the places you can visit in just one day and the price. Record the answer of the stand attendant and send it back” (figure 4), or “Go to the Awaodori Kaikan, and enquire about the price and schedule of the rope way. Bring back the schedule and send the recording of the characteristic music of the Awaodori, continuously playing inside this building, and a picture of the souvenirs displayed in the shop” (figure 5).

Figure 5: Examples of the pictures taken

The day of the experimentation the students gathered at the classroom with the teachers, picked up their PDAs and received instructions for completing the first task, subsequent tasks were provided by the teacher when they successfully achieved the expected results.

3.1 Results

After the experimentation, the students answered a questionnaire, assigning a number between one and five to each one of six questions (where one was the lowest and 5 the highest score) and writing down the advantages and disadvantages of the system, as well as their personal comments about the experience. Average results of the questionnaire and the standard deviation for each set of answers are shown in table 1. The average score for the questions was 4.1.

Table 1: Results of the questionnaire

No.	Question	Ave.	S.D.
Q1	Do you think that the one day trip with PDA was exciting?	4.9	0.4
Q2	Do you think the time allowed for completing the tasks was enough?	3.0	1.4
Q3	Do you think the PDA was easy to use?	3.3	1.2
Q4	Was the PDA helpful when you found some troubles completing the tasks?	4.4	0.5
Q5	Do you think the system was easy to use?	4.0	1.1
Q6	Would you like to use the system again?	5.0	0.0

According to question 1 (Q1) and question 6 (Q6) the students enjoyed the experience and would like to use the system again. Opinions were divided when asked about the time allowed to complete the tasks, as illustrated by question 2 (Q2). Similarly, some students found the PDA and the system easier to use than others (Q3 & Q5); this is partly related to their level of expertise using computational devices, and to the fact that the operative system was in Japanese. Nevertheless, we also had some troubles with the GPS and PHS, which were to be inserted in the CompactFlash slot and SD (Secure Digital) slot respectively, because they couldn't be used at the same time due to the closeness of the slots (figure 3). In order to indicate their position to the teacher, students were asked to change the PHS and GPS several times. Finally, they found the PDA to be helpful when confronted with situations that aroused doubts or questions to bring back to the classroom, or were uncertain about the goals of their task (Q4).

Among the comments there were some complains about the text input method of the PDAs, and the difficulties of using the GPS. Many students asked for more time to practice before the trip, especially those that were using mobile devices for the first time. Nonetheless, they found the system useful for learning local expressions, and practicing what they have learned in class.

The teachers where interviewed and their response to the system was positive, although they had some suggestions to improve it for the next time. Amid other comments, the teachers found the system to be useful for the students to practice Japanese in a real social context, and reported that their confidence for speaking increased after the experiment. Regarding the PDAs capabilities, they would like to have more choices, such as built-in cameras in all the devices, to broaden the options of the tasks. As for the instant messaging, they agreed with the students that more practice was needed before the experiment.

5. Findings of interest

Unlike other language learning systems not related to context, where the student is regarded only as a one-way knowledge consumer, LOCH takes advantage of technology to take the learning environment outside the classroom, where real life situations are taking place. In this way, the student has an active participation, recording events and taking pictures, and there is a two-way flow of knowledge, where the student is regarded as a knowledge provider as well.

The usage of a smart board for displaying the student's information ignited discussion, and the identification of different task solving strategies fostered constructive learning.

We found a work around for the GPS problem by using a Bluetooth GPS, the position of the student is now automatically sent to the server, without his/her intervention. Text input, however, is still intrinsically

related to the available devices, and meanwhile we will have to modify the interfaces to reduce it as possible.

6. Conclusions

This paper focused on the design, implementation and evaluation of a language-learning support system for overseas students in Japan; the project was called One Day Trip with PDA. The LOCH system provides the tools for the teachers to design diverse tasks, and the students to go around, carrying their PDAs, collect appropriate information and report back to the teacher. Moreover, the system is aware of the actual position of the students; hence the teacher can monitor their movement on his/her screen.

Students and teacher found it interesting, valuable, and were not only willing to try it again but excited about it. Since the experimentation we have been working on the improvement of the system, and testing with other devices and recently developed technologies. We are currently working on a different kind of PDA (Fujitsu Pocket LOOX) with Pocket PC 2003 second edition, which has a built-in 1.3 mega pixels camera, SD and CompactFlash expansion card slots. This device will comply with the requirement of the teachers to broaden the possibilities for the tasks.

As for the future work, we would like to enhance the presentation of the students' location map to the teacher, adding 'post-it' like messages over the locations highlighting the problems encountered. In the students interface, these problems and the solutions found by other students will be displayed as they approach the place. Another improvement would be to study the guidance messages sent to the students, and send them automatically next time.

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