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LEARNING LOG NAVIGATOR: SUPPORTING TASK-BASED LEARNING USING UBIQUITOUS LEARNING LOGS

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This paper describes a self-directed and task-based language-learning environment supported by "Learning-log Navigator", which is a function in SCROLL (System for Capturing and Reusing of Learning Logs). SCROLL allows learners to record and share their daily learning experiences as ULL (ubiquitous learning logs) with locations, photos and/or videos using their smartphones, and provides quizzes that are generated from ULL so that they can remember past learning experiences. Since the ULLs are shared with the other learners, the learner can learn new words from the other learner's learning experiences. However, answering quizzes is not enough in order to learn from the other learners' ULL. Therefore, this paper proposes a learning log navigator to recommend suitable tasks in the basis of learning by doing for sharing learning experiences. Also the evaluation was conducted by overseas students who learn Japanese language in Japan.

Keywords: Ubiquitous learning log; learning experience; augmented reality; task-based learning.

1. Introduction

In recently years, the smartphones market is growing rapidly and globally (Sharples, Arnedillo-Sanchez, Milrad, & Vavoula, 2009). Early smartphones were devices that mainly combined the functions of a PDA (personal digital assistant) and a mobile phone. But currently smartphones have been equipped with multi-touch interface, a full browser, GPS, an acceleration sensor, a high-quality digital camera and so on.

Using such functions of smartphones, SCROLL (System for Capturing and Reusing of Learning Log) has been developed in order to record and share learning experiences as ULL (ubiquitous learning logs) with locations, photos and/or videos in their daily lives. Also the system supports their learning by using ULLs (Ogata, Li, Bin, Uosaki, El-Bishouty, & Yano, 2011). SCROLL has been used in the context of language learning.

For example, if a learner goes to a super market, and learns a "Tofu", then the learner takes a photo and registers the word with the location. If the learner goes to the same market after some days, SCROLL automatically generates a quiz about Tofu, and shows the quiz to the learner. Then the learner can remember the word.

Since the ULLs are shared with the other learners, the learner can learn new words from the other learner's learning experiences. However, providing quizzes is not enough in order to share learning experiences, especially, when the quizzes are generated from

the other learners' ULLs. Therefore, this paper proposes a learning log navigator to recommend suitable tasks in the basis of learning by doing for sharing learning experiences. This paper also proposes a method to recommend effective learning activity to overseas students according to the learning by episodic memory theory (Tulving, 1972, 2002).

The target users of SCROLL are overseas students who studies Japanese language in Japan. That is because they acquire lots of knowledge from their daily lives, for example, when they go shopping, visit a museum or have haircut. Such learning activity is a kind of episodic memory for the learner which can help the students to remember the knowledge for a long term. Meantime, such learning activities are also helpful for the other learners who did not experienced and learned. Therefore, this paper proposes "learning log navigator" that recommends other learners' learning experiences as tasks, and then guides the learner to carry out the assigned task.

The rest of the paper is organized as follows. Firstly, SCROLL and previous works are described in section 2, and the learning log navigator is proposed in section 3. Section 4 gives the evaluation and results. Finally, this paper gives the conclusion and the future work of this study in section 5.

2. Previous Works and SCROLL

SCROLL has been developed for helping foreign students in Japan to learn Japanese language from what they have learned in formal and informal settings. For example, in their daily life when they go shopping or go the museum, they record what they have learned as a ubiquitous learning log (ULL) to the SCROLL (Dai, Luters, & Bower, 2005; Lin, Luters, & Kim, 2004). After that, the system helps them to recall their knowledge effectively using the photos and the location information.

There are many studies on task-based learning (Jonathan, 2011; Ogata, Saito, Paredes, San Martin, & Yano, 2008; Sharon, 2013). According to Ellis (2003), there are two types of task-based learning. One is called "task as work plan" that is conducted by the instructor of the lecture. The other is called "task as process" that is directed by the learners themselves. Through tasks, three different abilities including writing, listening and speaking can be trained efficiently. This paper introduces a research on "task as process".

The objective of this research is supporting oversea students learning Japanese in Japan, and we developed a system to help them share and review their daily learning experience as learning tasks. However, based on the evaluation we have done, we find this study can be improved in two aspects.

(1) The previous system only provides the learners quizzes using past learning logs. It is not enough to motivate learners to study more and it is also difficult for learners to acquire and remember the knowledge just by watching without experiencing. According to the learning experience theory, learning is defined as the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience (Kolb et al.,

1984). Therefore, in this study we want to change the learners from watcher to doer. We proposed the task-based learning that means the system recommends tasks for learners and the learners can learn by doing. The definition of learning task is a description of the process of a learning activity that consists of a series of learning logs. It is context-depended and can be shared among the learners. Learners who have experienced the activities provide learning tasks. It is an efficient way to reflect what they have learned by describing the experience (Tuvling, 2002).

(2) We found some researches on task-based learning such as Supporting Classroom Activities with the BSUL System (Ogata et al., 2008). BSUL aims to link inside and outside of the classroom by assigning each student with learning tasks. The teacher should create learning tasks in advance and then assign them to the students. When the student carries out the assigned task, he/she can ask the teacher any question online while the teacher can answer students' questions and assign new task to the student who have finished his/her tasks. BSUL is an example of "task as workplan". The architecture of BSUL is that users can upload their files and photos to the server, and then files and photos will be shared between teachers and students by PDA. BSUL did an evaluation experiment like this: Two classes used this system in two different semesters and 13 users (3 women and 10 men, between 20 and 35 years of age). All of them were overseas students enrolled in the Japanese language intensive course at the University of Tokushima. The students (from Korea, Bangladesh, Bhutan, China, Egypt, Peru, Malaysia, the Philippines, and Thailand) had different levels of expertise in the use of computer devices. Besides the students, two teachers of this course were directly involved during the development and experimentation phases of the project. The teachers scheduled the tasks for the students that included such activities as: "Go to the tourist information stand in Tokushima 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", or "Go to the Awaodori Museum and enquire about the price and schedule of the rope way. Bring back the schedule and send the recording of the characteristic music of 13 the Awaodori, continuously playing inside this building, and a picture of the souvenirs displayed in the shop" (Ogata et al. 2008). And then, they got the result of that they learned that the application of ubiquitous computing in classroom settings and other activities could award numerous benefits to the teaching/learning process, as long as it does not become an obstacle for its natural flow. However, it still needs to conduct further evaluations on usability and examine the system in different activities inside or outside classroom. From their evaluation experiment and result, we can see that the teachers are able to control the tasks and assign new task to students. Besides the learning based on these tasks can be conducted in short-term. It increases the learners work burden and the students cannot use the system when they are alone. Therefore, it is necessary to build a task-based learning system to assign learning tasks to learners and help them to finish their tasks.

3. Learning Log Navigator

The Learning Log Navigator is designed to recommend appropriate tasks to the overseas students, according to the task-level and learners' skill-level. The Leaning Log Navigator

is a function of SCORLL, which is to guide learners to participate learning activities in SCORLL (Mouri, Ogata, Li, Hou, & Uosaki, 2012).

3.1. *Analysis and recommendation in the Learning Log Navigator*

First of all, the learners are asked to provide their information such as native language, gender, Japanese language proficiency test level and major and on when they register our system. Because the objects of this study are the oversea students who are learning Japanese in Japan, and because the system would recommend the appropriate task for the learners based on their ability level, it is necessary to know the learners ability level. Because JLPT is an official test which is organized by the Japan Foundation and Japan Educational Exchanges and Services, the learner's ability level is referred to this JLPT level. However, not all the oversea students have this JLPT level. Therefore, we propose a way to calculate the learners' ability level based on their provided information in this system.

What we did is to analyze the knowledge (e.g. Japanese words) provided by the learner. Firstly, the system weights for learners' each word by looking up the level of each word in the dictionary of Japanese Language Proficiency Test. As shown in Figure 1, difficult word is put at high weight, easy word are assigned by low weights. So overseas

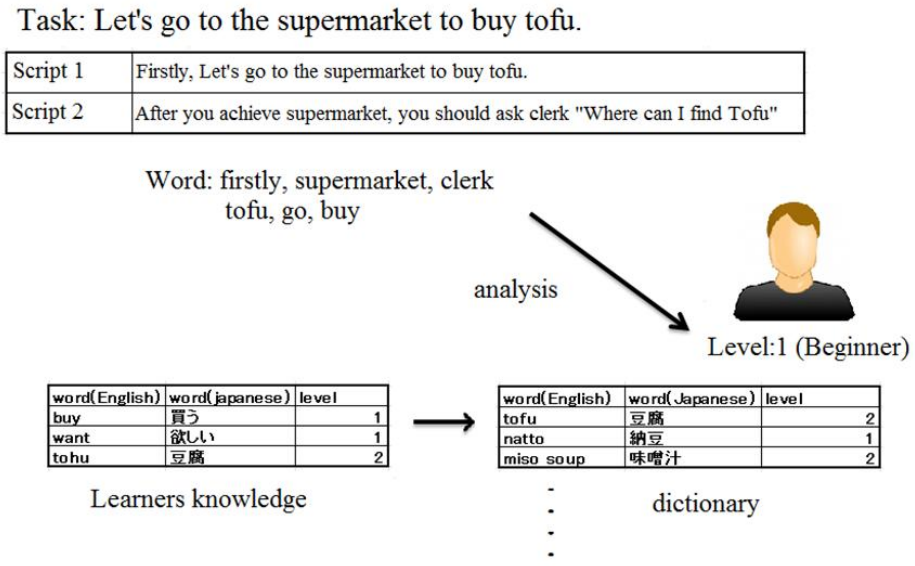

Figure 1. Analysis and recommendation.

students' level can be analyzed by the words they have added to system and the knowledge they have learned. Moreover, we use the similar way to analyze the level of the task. The method of analysis is the comparison of dictionary and morphological analysis of script, and the same level task will be recommended to students.

Besides the learners' ability level, there are two another factors to recommend knowledge for the learner. One is what the learners have learned. For example, in Figure 1, if they have learned the words like "buy", "want" and "tofu" in SCROLL, the system will automatically recommend learners' related tasks by these words such as the task of "going to the supermarket to buy tofu". The other factor of recommendation is the location information. This is because that the near tasks are easy for the learners to carry out. The max distance is 10 km. The whole flow of recommendation and analysis of Learning Log Navigator is described as follows.

(1) Step 1: As shown in Figure 2, the system will firstly recommend the task near the learner. This is based on the latitude and longitude which are recorded in the task by device's GPS information. Besides, the system will recommend task until maximal 10 km from the position of students.
(2) Step 2: The number of task will be controlled by system. If the number of recommended task is too large, students will be confused by how to select the right task. Therefore, the max number of recommended task is 10. The recommended turn is ordered by geographic information.
(3) Step 3: The function of selection is essential. If students think the recommended study location is not appropriate them, they can change the limit of distance in geographical information, for example, if students want to buy tofu and there are so

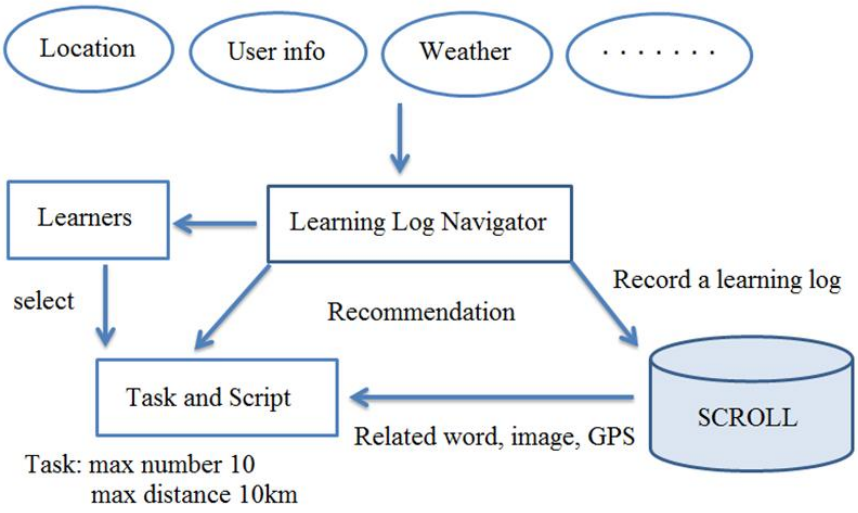

Figure 2. Flow of learning log navigator recommendation.

many supermarkets around them. Because of the number limit in system, system will prepare maximum ten tasks for students, but when students want to know farer supermarket than before, they can get them by changing the limit of distance.

3.2. *How to carry out a task?*

According to the Learning experience theory and episodic memory theory, it is necessary for system to get photos and contexts to guide students to experience daily life Japanese language learning activities. The rest of this section describes the detail of the function.

At the beginning, the Learning Log Navigator will provide learners with appropriate tasks by analyzing theirs' learning logs. Then, the system guides students to finish the task by making use of the learning environment. Because group learning is good learning efficiency, so system is suitable for situation that achieve task with friends, however in our daily life, it is always not like that. When students would like to go shopping or go to restaurant personally, they have to search geographic information and the way to destination. The interface for solving this problem is shown in Figure 3. After students select a task, the content of this task will be verified by students for one time. If they believe that they can complete it, they can use the system to be guided to the learning area. The task of "Going to supermarket to buy tofu" is shown in Figure 3. System will receive the GPS information from students' devices and guide the way to destination of supermarket for students.

Finally, after students achieve the destination, system will recommend learning log for them. After students select the task which they want to study, to gain the knowledge, the necessary information and the word, the image students didn't know will be provided by system. For instance, when "after you achieve supermarket, you should ask clerk 'Where can I find tofu'" will be reminded by system, system will provide some words

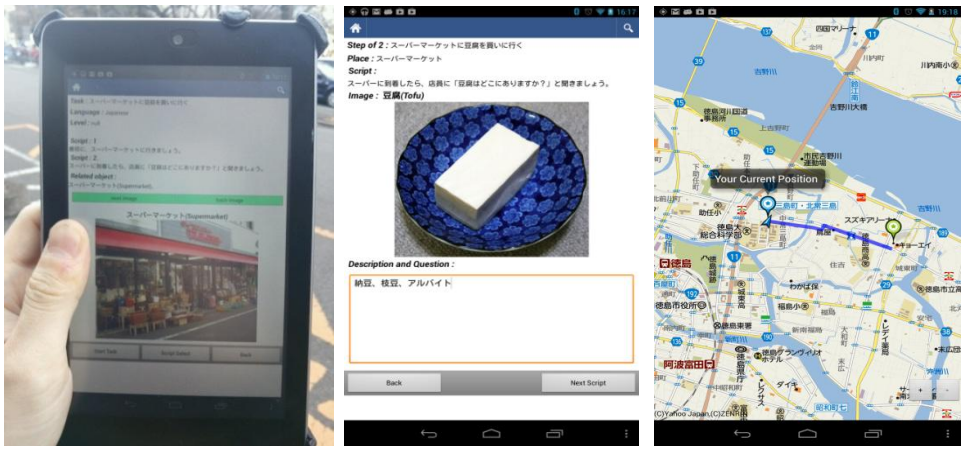

Figure 3. Learning Log Navigator interface.

like “Natto”, “Green soybeans” and images that is relevant to the circumstances from SCROLL. Task is a kind of log of daily life experiences, so people can learn reading and writing by tasks. Moreover, task scripts include those daily life communication and conversation. For example, if you are using a task of “Please ask shop stuff the price of ‘tofu’”, our task will tell you how to say the sentences by voice and text, so you can communicate with stuff by our information.

What’s more, the knowledge that students didn’t know will be described at the note field on the devices, and system will review the knowledge that students didn’t know. Also, because the knowledge that students didn’t know can be shared by other overseas students, so system will become like that they can solve the problem with each other. Based on these interfaces, analysis and recommendations for overseas students and automation systems will be provided.

4. Evaluation

Six international students studying at the University of Tokushima participated in the evaluation experiment. All of them were from China aged between 22 and 28. Their length of stay is from1 month to 5 years, and their JLPT levels are from 1st to 3rd grade (Table 1).

4.1. *Method*

Before the evaluation started, the participants took pre-test, which consisted of 10 multiple-choice questions. The questions were made from the knowledge we learn through everyday life. They saw the name of objects written in Japanese letters, “katakana” and chose the correct images. Since all the participants were Chinese and understood Chinese characters, “katakana” was the most difficult letters for them. That was the reason why the question word was written in “katakana”.

Android tablets were delivered to all the participants on one-to-one basis (Galaxy Tab Model: GT-P1000). They used Learning Log Navigator System and did some tasks. The challenge levels of the tasks were based on their Japanese Language Proficiency Test so that each participant could select the tasks which fit their levels.

Table 1. Detail of students.

	Age	Length of stay	Japanese Language Proficiency Test
Student A	28	5 years	1st Grade
Student B	27	5 years	1st Grade
Student C	22	6 months	2nd Grade
Student D	23	1 months	2nd Grade
Student E	24	1 months	1st Grade
Student F	24	1 months	3rd Grade

Table 2. Contents of task.

Task name	Level	Place
Order hamburger	2	McDonald
Play bowling games	3	Bowling alley
Order sushi at Sushi bar	2	Sushi bar
Buy natto	1	Supermarket
Go to a hot spring	2	Hot spring
Have hair cut at a barber shop	1	Barber shop
Play golf	3	Golf driving range

Table 2 lists the task contents. The participants were all smartphones owners and three of them had used SCROLL before. They were asked to do at least two tasks listed in the Table 2. Three to seven days after finishing the tasks, they took Post-tests. Post tests were also image based multiple-choice questions made based on the tasks they did.

The questionnaires were given to the participants after they did the tasks so that we could examine the impressions they had about our system.

4.2. *Result and discussion*

The average scores and standard deviation of pre-test and post-test are shown in Table 3. The result shows that the average score increased by 1.17 points after they did tasks. This means they could learn by the system without feedback from the teacher or the system administrator.

The questionnaire results are presented in Table 4. Q1 and Q2 results were most highly rated. It means that they had a favorable impression on our main purpose of this system, which was to provide a self-directed task-based learning environment. This result indicates that the system recommended necessary and related knowledge to the tasks. The

Table 3. Result of the five-point-scale questionnaire.

	Mean	SD
Pre-Test	6.83	1.57
Post-Test	8.00	1.52

Table 4. Result of the five-point-scale questionnaire.

Question	Mean	SD
1. Was if helpful to recommend knowledge and images which are concerned with the task?	4.66	0.81
2. Was doing the task impressive enough to retain in your long-term memory?	4.66	0.51
3. Was the navigation function helpful?	4.33	0.81
4. Was Navigator interface easy to understand?	4.16	0.98
5. Did the difficulty level fit your language level?	4.16	0.75
6. Could you keep your learning motivation during the task?	4.00	0.86
7. Did human interaction occur during the task?	4.00	0.89

improvement from Pre- to Post-test endorsed this fact. Therefore we can safely say that the recommendation system worked as effectively as teachers do.

Q3 and Q4 results show the students' impression on how effectively the system navigated them to the spots. It was found out that the system's navigating function worked effectively since they gave good rates on these questions.

Q5 asked them if the task fit their language level. Since their learning logs were too few, the system could not judge their language level, so they were asked to choose the tasks themselves. That is one of the reasons why they gave good rates on this question. In the future the system is supposed to analyze the students' learning logs and recommend the tasks to do.

In their experiment using BSUL system (Ogata et al., 2008), the students spent much time to carry out the whole task because they had to ask the teacher how to use the device and how to carry out their tasks. On the contrary, our learning log navigator automatically shows them how to proceed. "Go to a hot spring" task, for example, the student could complete this task very smoothly because he could get the help from the system at the appropriate timing. However, when some unexpected problems happen during the task, the system cannot support them enough to solve these problems. When students carry out "go to a hot spring" task, it is likely to happen that they meet other people and start conversation. They have to solve the problems which happen during such unexpected conversation by themselves. Therefore the system needs to predict and prepare the situations which might happen during the task as much as possible in order to help them. By doing the task repeatedly by many different students and by uploading the knowledge they have learned during the task to the system, the necessary knowledge could be accumulated so that the system can help future learners more effectively.

Q6 to 8 asked them about motivation, human interaction, and fun factor. Unlike group works, human interaction or communication among learners are not likely to happen while doing self-directed learning. However the questionnaire results were more positive than expected. We believe the task instructions encouraged the students to get

Table 5. User comments.

Users' suggestions (Open-end questionnaire)	
1.	Voice recording function might help to keep logs when something came up to mind.
2.	The time limitation looked like a game. So the user got more motivated to do the task
3.	It was so good.
4.	I suggest to provide some functions like a void recorder
5.	It was like a game or something else and it was fun.
6.	It was beneficial for my Japanese study.

involved in conversation with the counterparts such as staff and salespeople. As for motivation, they gave high rate on Q6 which asked them if they could keep motivation while doing the task. Together with Q8 result, we interpret they could keep high motivation because the task was enjoyable just like playing the game.

Table 5 lists the open-ended comments of the participants about the problems they found using the system and their suggestions for the improvement of the system. It was suggested that voice-recording function would be helpful to log their learning experiences. It was also suggested that setting a time limit might increase a sense of playing a game.

Though there are loads of things to be considered to set a time limitation such as distance to the task spot, means of transportation, weather and so on, it is being planned to challenge these two suggestions in the future. Taking these issues into account, our future works will be described in the next section.

5. Conclusion and Future Work

This paper described Learning Log Navigator System in SCROLL. Students can add their word and knowledge in SCORLL, and then SCROLL can provide language learning to recall what they learned based on their learning contexts. And Learning Log Navigator uses the log of students in SCROLL to share with each other, and guide students to experience real life Japanese learning activities by the words they learned. Learning log recommendation and a task-based learning function were two of our aims in this study. The initial evaluation was conducted after implementing the function that enabled a no teacher learning. Five-point-scale-survey conducted after the evaluation show that the system effectively supported the participants learning by doing tasks from the view point of learning the necessary and related knowledge, navigating them to the spot, and maintaining their motivation.

As mentioned in section 4.2 Result and Discussion, the support from the system during the task is not enough. In order to provide more effective support, the system needs to predict and prepare necessary knowledge and information during the task-based learning. A new interface is needed to be developed so that the learners can easily upload what they have learned to the system. The questionnaire result shows that our learners

had not been motivated enough. We need to cope with this problem. In order to solve this, we are going to introduce game elements in our system such elements as in adventure games and RPG games. We expect that such game elements will be able to let the learners enjoy doing tasks. We believe it will enable them keep their learning motivation, which leads them to gain their knowledge effectively.

As our future work, we are planning to make our system more supportive by adding new functions such as voice recording, timer setting as suggested in the post survey. It is expected to make self-directed learning more effective. We are planning to conduct more intensive evaluation after implementing new functions which will be able to analyze students learning logs and recommend them more appropriate knowledge at more appropriated time, and place.

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