Developing a Context-Supported Chinese Grammar Learning System in Mobile Environments

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Abstract: This work develops a context-supported Chinese grammar learning system on the Android platform for use by Chinese as a Foreign Language (CFL) learners in mobile environments. Users can interact with the system by selecting a grammar word and a situational context (e.g., person, place, and activity) as a query, and the system will return a list of relevant sentences corresponding to the selected grammar word and context. These sentences would help users learn appropriate usages of the grammar words in the right context. The user interface represents situational contexts using pictures for ease of context selection. The sentences used for retrieval are gathered from some corpora for Chinese learning and revised by a human expert to improve readability in the corresponding context.

Keywords: Context-supported grammar learning, Android apps, mobile learning

1. Introduction

Different situations may involve different language usages, e.g., when interacting with police officers or classmates. Language usages may also vary between different activities such as shopping, traveling, and exercising, and between different places such as airports, schools, and hospitals. For second language learners, understanding such contextual differences allows them to use the foreign language more appropriately in different situations. In this paper, we develop a context-supported Chinese grammar learning system for Chinese as a Foreign Language (CFL) learners on the Android mobile platform. Users can interact with the system by formulating a query through selecting a grammar word and a situation (e.g., person, place, and activity). The system will return a list of sentences corresponding to the selected grammar word and the situation based on information retrieval (IR) [1][2] and natural language processing techniques [3]. Users can then learn the appropriate usages of the grammar words for different situations by reading the retrieved sentences. The user interface presents a graphical representation of the situations using pictures for ease of context selection. Additionally, to ensure the quality of the learning materials, all the sentences used for retrieval are gathered from some corpora for Chinese learning and revised by a human expert to improve readability for the corresponding context.

2. System Development

The context-supported grammar learning system features three main components: the grammar word, context, and retrieved sentences, described as follows.

2.1 Grammar Word

In interacting with the system, users first select a grammar word. This propotype system includes four Chinese grammar words: 把 (*ba* – imperative modifier), 被 (*bei* – passive modifier), 給 (*gei* – "give"), and 讓 (*rang* – "let"). Figure 1(a) shows a screenshot of the user interface for grammar word selection.

(a) (b) (c)

Figure 1. Screenshots of the user interface for (a) Grammar word selection (b) Situation selection (c) Sentence retrieval.

2.2 Context

This prototype system includes three kinds of situational contexts: person, activity, and place. Through these situations, users can learn various usages of the grammar words when interacting with different people in doing different activities or at different places. For context selection, the user interface presents pictures rather than texts to represent the various situations, as shown in Figure 1(b). Table 1 lists all the situations and their corresponding pictures currently developed. To prevent ambiguity, three foreign students were asked to annotate each picture with a short text such as a word or a phrase. These annotations were then compared for consistency. Pictures with consistent annotation were directly included into the system without phrase descriptions. Otherwise, the pictures were annotated with their descriptive phrases before being included in the system (see the "Friends" example in Table 1).

2.3 Sentence Retrieval

The selected grammar word and situational picture are treated as a query to retrieve a list of corresponding sentences using keyword-based information retrieval methods. Each

picture is associated with a set of predefined keywords corresponding to its meaning. In retrieval, the system automatically converts the input picture to its corresponding keywords and then combines them with the grammar word to retrieve the sentences containing the keywords. Figure 1(c) shows the sentences retrieved for the grammar word 把(*ba*) and the situational picture "family". The keywords for each picture were compiled manually, and can include material from the descriptive phrases provided by the annotators or from lexical ontologies and thesauri [4][5]. E-Hownet [6] was used to collect the keywords based on each picture's descriptive phrases. Sentences containing the grammar words 把 (*ba*), 被 (*bei*), 給 (*gei*), and 讓 (*rang*) were then collected from corpora including the Mandarin Daily News [7] and several web-based resources [8-9]. The sentences were then revised by a human expert to improve readability for the corresponding situation. Table 2 presents some sample sentences for the grammar words.

Table 1. Situation pictures and their text descriptions

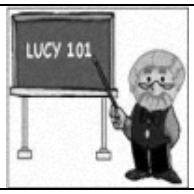
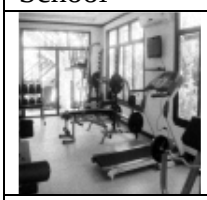
Situation	Picture			
Person				
	Family	Friend	Police	Pastor
				
	Doctor	Librarian	Teacher	Waiter
Activity				
	Eat	Drink	Wear	Pray
				
	Entertainmen	Excercise	Shopping	Reading
Place				
	School	Classroom	Supermarket	Hospital
				
	Gym	Room	Station	Airport

Table 2. Sample sentences and their situation keywords.

Grammar word	Example sentence	Situation keyword
把 (Ba)	我會把學校裡好玩的事告訴奶奶 I will tell Grandmother about the fun things that happened at school.	Person: 奶奶 (grandmother) Place: 學校 (school)
給 (Gei)	媽媽會準備一些飲料給我們喝 Mother will prepare some beverages for us to drink.	Person: 媽媽 (mother) Activity: 喝 (drink)
讓 (Rang)	老師讓我們打籃球 Teacher let us play basketball.	Person: 老師 (teacher) Activity: 籃球 (basketball)

3. Conclusions and Future Work

This work presents the development of a context-supported grammar learning system for CFL learners to learn appropriate language usages for different situations. This prototype system was developed on the Android platform to enable mobile learning. The user interface presents pictures to represent the various situations, annotations for which were analyzed and improved to prevent ambiguity. Future work includes a series of experiments to evaluate its usability, and collecting more grammar words and learning corpora to improve the system.

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