

Adaptation in a Language Learning System

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Abstract

In this paper we present an ongoing research project which aims at developing an electronic vocabulary acquisition system for the German and the Italian language. To ensure maximum effectiveness of the learning process, modern psycholinguistic methods are applied alongside with new media and technologies including adaptive hypermedia. In this paper we focus on adaptive features and we will outline first ideas about the use of adaptation technologies for vocabulary acquisition.

1 Introduction

Recent research in the field of computer-assisted learning shows that multimedia and hypermedia teachware seems to be motivating for learning [7]. We are currently developing an adaptive teachware system in the domain of foreign language learning. The ongoing research project ELDIT aims at developing an electronic vocabulary acquisition tool for the German and the Italian language. The system contains a user model, adapts its content to the individual needs and preferences of each user and guides the user through a systematic and individually shaped vocabulary acquisition process. This paper outlines first ideas about adaptation in the ELDIT system. The evaluation of the system remains future work.

The paper is organized as follows: Section 2 describes the basic dictionary, which in section 3 is extended to a systematic vocabulary acquisition system. Section 4 outlines first ideas about the use of adaptable and adaptive features for vocabulary acquisition. In section 5 we discuss related systems.

2 The ELDIT Dictionary

Back in 1950 lexicographers started to develop so-called learners' dictionaries. It differs from an ordinary dictionary in several ways: The vocabulary coverage is limited,

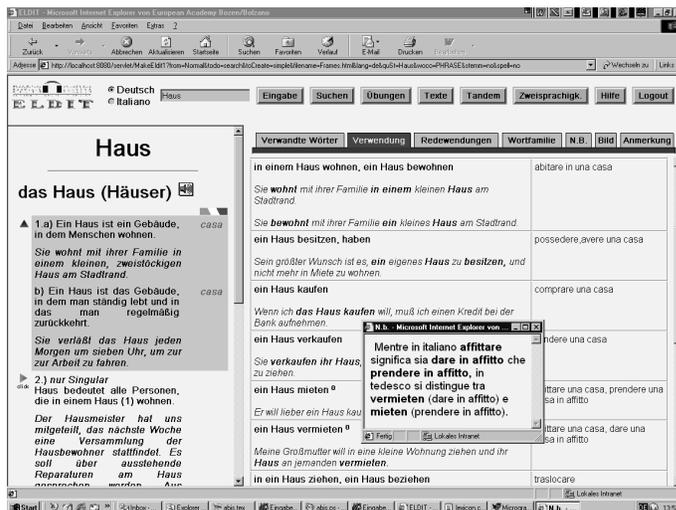


Figure 1: ELDIT screenshot showing the entry for the German word "Haus".

word definitions are simpler and often supported by a picture, and carefully selected lexicographic patterns and examples show the typical use of a word.

At the European Academy Bolzano we are currently developing an electronic learners' dictionary for the German and the Italian languages. The system is called ELDIT (Elektronisches Lern(er)wörterbuch Deutsch ITalienisch). For each word a complex set of information is stored. The information is presented in two different frames (see figure 1). The left-hand frame shows the lemma ("Haus", English *house*), a loudspeaker-button which on activation plays a sound file with the pronunciation of the word, as well as different meanings of the word. The right-hand frame shows additional information. This information depends on the meaning and is organized in a number of tabs, e.g. the collocation tab, which lists the most frequent collocations together with their translation and an illustrative example. Moreover, ELDIT stresses particular differences between Italian and German. An more comprehensive description of the linguistic and didactic features of the system is given in [1].

3 From the Basic Dictionary to a Vocabulary Acquisition System

3.1 Learning the Basics of a Word

Extensive word exposure is necessary in order to ensure a deep and solid embedding of new words in the mental lexicon [2]. Furthermore, the linguistic characteristics of target language input need to be made salient [6]. Considering these recommendations, we distinguish 3 consecutive steps of the word acquisition process (similar to [9]), in which the user intentionally learns a new word:

Perception. In a first step the learner should explore the various properties of a word. The different meanings shall become clear by reading the definitions and translations, viewing the image which represents a prototypical object, and examining related words shown in an interactive graph. In this way different word meanings shall become clear and distinguishable.

Usage. The next step is to learn how to apply a word in a specific context. The learner is asked to study explicitly the patterns for word usage, i.e. the collocations and idiomatic expressions. In this way new word combinations are acquired and misconceptions can be eliminated.

Characteristics. In order to enlarge and complete the knowledge about a word the learner should study differences between the two languages concerning the specific word and its usage.

3.2 Applying the Language

In order to retain the acquired vocabulary, the learner has to produce target language output [6]. ELDIT provides text units which allow the student to practice the new vocabulary. The text corpus includes approximately 300 texts for each language. The texts are short articles selected from various magazines and books. Every word is linked to the corresponding dictionary entry such that the learner can easily check unknown words. The educational value of this approach is widely accepted [10, 13, 14]).

Each text unit contains a couple of questions about the text. After reading the text the user is asked to answer these questions. As the system is not able to correct the student's answers and to give feedback, we are implementing a peer-assessment feature which brings Italian and German native speakers together to form learning partnerships with the aim to correct exercises from learning partners and to provide further help.

4 Adaptation in ELDIT

ELDIT provides a huge amount of information for each word as well as a large number of texts and exercises. All these pieces of information are carefully selected and prepared. Still it is questionable whether all users will be happy with the current presentation of the information and whether the provided information really meets just basic requirements? Different users have different needs. This problem can be tackled by adapting content and presentation of the dictionary to the individual user.

We distinguish adaptable and adaptive features of the dictionary. Adaptable features allow for the manual customization of the system by the user. Adaptive features cover the aspect that the system adapts automatically to the user based on assumptions about the user as well as observations about the user's interaction with the system.

Feature	Choice of user	Elements affected
model	monolingual/semibilingual	translations, labels, explanations
domain	general/medical/technical	lexicographic examples
difficulty	beginner/advanced	meanings, idiomatic expr.
help	novice/familiar	content of and links to help file
pronunciation	local/standard	sound file
annotation	—	annotation content

Table 1: Customizable features in ELDIT.

4.1 Customization of Information Presentation

Table 1 summarizes the customization features of ELDIT.

ELDIT is a semi-bilingual dictionary. Word meanings are described by both a definition, which is a typical element of a monolingual dictionary, and a translation equivalent in the other language, which is a typical element of a bilingual dictionary. The user can choose between a semi-bilingual or a monolingual version of ELDIT. In the semi-bilingual version the user interface (menu entries, labels on buttons, etc.) appears in the native language of the learner while in the monolingual version the user interface appears in the same language as the word entry itself. Similarly, explanations like linguistic differences between the two languages are shown either in German or Italian depending on the model of ELDIT.

ELDIT makes extensive use of so-called lexicographic examples to show various aspects of the language. In order to support special languages for different domains and professions, these examples depend on the user's background or profession. Currently, just a few exemplary words are elaborated, which contain different lexicographic examples for the general, medical, and technical language.

Depending on the language skills of the user more or less detailed information on the words will be given. For beginners too detailed differences between the word meanings or complicated idiomatic expressions are hidden in order to avoid information overload.

Another feature is the customization of the help files. The user is asked about his/her familiarity with the use of computers. Depending on the indication "novice" or "familiar", the online help is more or less detailed. Moreover, for a novice the dictionary entries contain a couple of direct links to the corresponding help sections.

Two more features are the possibility to listen to different pronunciations of a word (local versus standard German and Italian) and the possibility to save personal annotations to each word.

Figure 2 shows the entry for the German word "Haus" for a typical beginner in German. The screenshot is different from the one shown in figure 1 for the same word. The description of the word meanings is less detailed, and only the most important meanings are presented. Furthermore, the user prefers a monolingual dictionary. Therefore, no translations are shown, and the menu and the footnotes are in the same

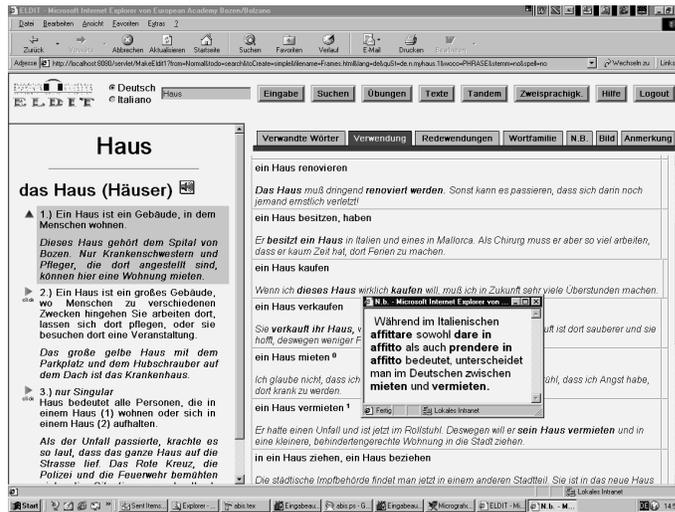


Figure 2: Adapted ELDIT screenshot for the German word "Haus".

language as the dictionary entry. As the learner's professional background is medicine, the lexicographic examples contain a lot of medical terminology.

4.2 Observing the User

We will now concentrate on the system's capability to record the user's interaction and on various kinds of adaptive features.

Once a user begins to use the ELDIT dictionary, a general introduction to the system will be provided which explains in detail how the system shall be used. As it has been done in the AHA system [3], this page will be removed the second time the user accesses the system and replaced by a link.

A first informal evaluation also revealed that in order to improve the user-interface some additional hints are required, e.g. direct links to the different help sections (e.g. how to use the search feature, how to save an annotation, how to access the information on the right hand side, etc.) or some labels containing "click here" information (e.g. below buttons and tabs by which the user can access information). This labels and links will be left out incrementally when the user has read the corresponding help section and generally has experience in using the system.

ELDIT includes a session tracking feature which records the user's interaction with the system. By default none of the information provided to a word is activated automatically, but the user has to click the corresponding tabs or buttons. The system is observing the user in his/her navigational work. When preferences for specific information can be figured out, these pieces of information are shown automatically to the user. For example, if a user always listens to the pronunciation of a word, the system may automatically play the sound file when a new word is accessed. Similarly, if the user always watches the pictures, they might be shown automatically once the user

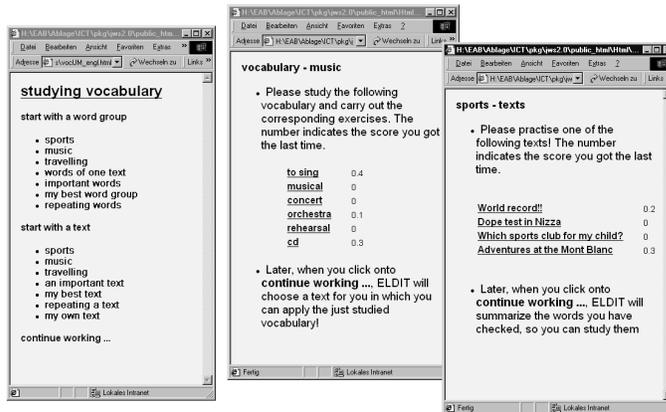


Figure 3: A possible learning scenario

selects a specific word meaning.

The user can change the data in the user model or manually turn off the adaptation feature, if he/she is satisfied with the default settings of the system.

4.3 Individualized vocabulary acquisition

The ELDIT system will support the following approaches to vocabulary acquisition:

- *Vocabulary acquisition by word groups:* The system will offer different groups of words to be studied: e.g. words which belong to a specific domain, words which occur in a specific text, etc. Words are listed with an indication on how well the user already knows each word. This approach has been used in different systems and has been shown to be useful for students who are willing to collaborate with the system [5, 4]. Once a group of new words are learned, the system selects for the user a text which matches best the just studied vocabulary and other already known words. In this way the new vocabulary will be repeated immediately on a small text example.
- *Vocabulary acquisition by texts:* The second possibility to learn new words is to start from a text example. The user can choose a specific text or accept one of the texts recommended by the system. Similar to the words also the texts are listed with an indication whether and how well a text has already been worked through. Once the user worked through the text as described in section 3.2, the system summarizes all words for which the user accessed the dictionary entry and proposes these words for a more detailed, systematic study.

We will now describe a typical learning scenario. A user who starts to work with ELDIT encounters the first interface shown in figure 3 (to facilitate reading the texts

are in English). He/She can now decide to study a couple of words (a more systematic way) or to work through a text (a more exploratory way).

Suppose the user decides to study new words concerning music and he/she selects the corresponding link in the list of word groups. The second window in figure 3 appears. The user is asked to study these words as described in section 3.1. After learning the new words, the user can click onto “continue working...”. The system then proposes to the user a text suitable to practice the new vocabulary. Afterwards the answers to the questions should be sent to an e-mail partner.

After working with a text, the user has the option to consolidate difficult or unknown words from this text, i.e. words for which the user accessed the dictionary entry. These words are listed similar as before. The user can study these words, again practice them on a text, etc.

5 Related Work

Adaptive systems have mainly been developed for teaching natural science and computer science [3, 8, 12, 5]. Only a few adaptive systems exist for computer assisted language learning. One of these systems is Castle [11]. In this system the traditional grammatical approach is combined with a more functional communicative approach. The knowledge items are organized in a kind of semantic net. What the content of the teaching material concerns ELDIT further differs from Castle in its systematic approach to vocabulary acquisition.

TAIT [15] is an adaptive system which can be used for training pronunciation capabilities. Language patterns are recited and the student is supposed to repeat them. The system uses speech recognition software in order to record the users voice and to check the input for errors. A user model is maintained and different users get different feedback messages at different times of their work. TAIT is one of the rare systems which provides facilities for systematically repeating formerly studied concepts. The methods and criteria are similar to the one applied in ELDIT.

6 Conclusion

In this paper we described ELDIT, an adaptive vocabulary acquisition system for German and Italian. The system contains a large amount of information for each word entry including grammatical information, collocations, etc. Currently, the system is being enlarged with exercises, text units, and questions. ELDIT is based on modern psycholinguistic theories and didactic methods and explores the potential of hypermedia technologies in order to structure and present complex information in a user-friendly way. The system will be extended with personalization and adaptation features in order to improve the learning efficiency by providing an individual access to the large amount of information about words and its usage.

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