International Conference Advances in Infrastructure for e-Business, e-Education, e-Science, and e-Medicine on the Internet, L'Aquila, July 29-August 4, 2002.

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Children Multimedia Dictionary

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Abstract—**The dictionaries play an extremely important role in human life, especially in educational activities of various types. Due to the new information technologies, nowadays the modern electronic dictionaries provide much more opportunities and possess higher illustrative power than the traditional ones.**

A very important and specific group of dictionary users are the children. In the present paper we share our experience in designing a multilingual multimedia electronic dictionary which is supposed to help children learn their native language or languages that are not native to them. The dictionary is maximally user-friendly, the child can work with it by herself, with no help from parents, and can study a language in a more pleasant and appealing manner. The dictionary features, interface, and first prototype are presented together with discussion and analysis of some typical problems.

Index Terms—**e-education systems, multimedia-based learning systems, multimedia database, multilingual dictionary, children perception.**

I. INTRODUCTION

T HE dictionaries play an extremely important role in human life, especially in educational activities of various types. They appear to be a key component that supports learning natural languages or obtaining useful knowledge in uncountable many branches of human practice.

Dictionaries have been proposed almost about everything: from natural human languages to arts and sciences, fashion, plants, and animals.

Due to the modern information technologies, in the last decade the dictionaries have developed significantly. Nowadays, one can use *talking dictionaries*, *visual dictionaries*, as well as *multimedia dictionaries*. Creating such kind of dictionaries as well as studying and analyzing the issue from theoretical, practical or other points of view, have attracted a lot of interest and resources in recent years. For instance, a quick search with Google search engine by keyword "talking dictionary" exposes 422,000 items, by keyword "visual dictionary" — 444,000 items, and by

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"multimedia dictionary" — 346 items. Even a brief review and rough classification of all existing electronic dictionaries is a difficult task.

The modern electronic dictionaries provide much more and better opportunities than the traditional ones. From quantitative point of view, the amount of information that can be stored in a database can be significantly larger. Also, thanks the advanced database compression technology (see, e.g., [1]) as well as some very efficient text searching algorithms (see, e.g., [2]), finding a particular word is almost immediate.

From functional point of view, the benefits of a technology-based dictionary are even more valuable. Objects and notions can be easily illustrated by pictures, schemes, diagrams, as well as by sound and even by video clips. Natural or synthesized voice can also be added. Some of these tools may be of great importance. For instance, the user of a language dictionary can listen to the pronunciation of the words. Also, spell-checking technology can be used to show alternatives when a word is misspelled. The possibility of using voice may be crucial in certain cases, e.g., in dictionaries for non-sighted people [3].

In the present paper we describe an electronic dictionary aimed at supporting children in their study of seven languages. The general setting, the structure and various functions of the dictionary have been decided after careful study and analysis of this very specific audience. Various important features of children psychology have been taken into account. In particular, the children are quick learners who, however, cannot concentrate their mind on a specific topic for a long time. They tend to follow other people's behavior and habits, which phenomenon is reflected also in the way they are used to learn. For further details and more comprehensive analysis of the learning mechanisms we refer to [4].

Our dictionary provides various options. The words are grouped into categories. For each word one can see its picture and spelling, to listen to its pronunciation and to see typical sentences with this word.

In addition, there are video clips helping children understand some difficult notions. Word puzzles and multi-level games support language learning in a natural way and contribute to the relaxing atmosphere during the study. Quizzes for evaluation and self-evaluation of the current knowledge are also available.

The dictionary includes about 1,000 words in each of the following commonly spoken languages: English, French, Russian, and Spanish, as well as in some South-Eastern European languages as Albanian, Bulgarian, and Turkish. The

presence of the latter group of languages is motivated by the fact that these countries are becoming open to Western culture and there is a big demand of educational materials.

In Section 2 we make an overview of some existing multimedia dictionaries and provide discussion on the matter, aimed at clarifying certain important points of different nature. In the basic Section 3 we describe the main features of our project and the developed prototype. Section 4 presents some future tasks of our project.

II. OVERVIEW OF SOME EXISTING MULTIMEDIA DICTIONARIES

In the present section we briefly describe some known multimedia dictionaries. This may help illustrate the current achievements in the field and reveal some important related issues.

A. Monolingual dictionaries

1) *American Heritage Children's Dictionary* [5]. It is a CD-ROM multimedia dictionary involving over 37,000 different word entries in English, 13,000 of which with real-voice pronunciation, illustrated by 3,500 pictures, animations, and sound effects. It includes a lot of classic multi-level word games and other activities.

2) *English Dictionary of Show TV* [6]. This is a web-based multimedia dictionary of English language. For each letter of English alphabet, a window with four words illustrated with pictures and pronunciation is displayed. Its main purpose is to help children learn English as a foreign language. (Fig. 1.)

Fig. 1. A sample page of Show TV English Dictionary for letter "I".

3) *Additionario: An Italian Language Dictionary* [7]. This is a multimedia dictionary for 6-14-year-old children studying Italian either as a native or as a foreign language. It includes about 1,000 core words and is written and illustrated by the children themselves. This is done using the creative tool Activity Book which allows the children to construct their own personal dictionaries, adding new words, examples, and illustrations. The dictionary is available on CD-ROM.

4) *Polish Picture Dictionary for Children* [8]. This is a CD-ROM multimedia dictionary of Polish language for 5-8-year-old children. It includes a list of 1,000 core words and a number of interactive animated word games. It can run under Windows 95 or higher. (Fig. 2.)

Fig. 2. Polish Picture Dictionary for Children.

5) *My First Incredible, Amazing Dictionary* [9]. This is a CD-ROM dictionary, including approximately 1,000 entries in English. Each word is accompanied by an animated picture and pronunciation. Many games and learning activities are included. The program runs on Macintosh and IBM compatible computers.

B. Bilingual and Multilingual Dictionaries

1) *Junior Talking Dictionary* [10]. This is a multimedia dictionary including over 1,000 nouns in French, German, Italian, and Spanish, classified into 58 different categories, as diverse as "Ancient History," "Transport," and "The Human Body." For each noun a corresponding picture and pronunciation are given. Over 50 frequently used verbs are included for each language. A child or parent may add new words and record real-voice. It is available on a CD and runs under Windows 3.1x or later.

2) *"Lexipedia"* [11]. This is an ongoing project for a multilingual multimedia dictionary for children intended to support Greek, English, French, German, Russian, and Bulgarian.

3) *HuiFeng Chinese – English Children's Picture Dictionary* [12]. Hui Feng Children's Picture Dictionary is a typical sample of multimedia bilingual dictionary for children. Each word entry includes visualization and both English and Chinese pronunciation. Various exercises are included as well.

4) *Chinese – English Multimedia Dictionary* [13]. This multimedia dictionary includes over 30,000 important daily life English/Chinese words and phrases, as well as an animated demonstration how to write over 1,000 traditional Chinese characters. The students can listen, speak, read, and write Chinese through interactive media, such as 3D scenes

and games. They can also record their own voice and thus control the pronunciation. In addition, the dictionary also provides comprehensive information about Chinese history and culture. It runs on Windows 3.1 or higher.

The above examples briefly illustrate what kind of opportunities a modern multimedia dictionary may offer. The development of a new electronic dictionary is a difficult task including efforts of many people: computer experts, language experts, graphics designers, and sound and video recording professionals. In distinct from traditional dictionary where only text information is included, in electronic dictionaries for each word one has to choose a picture, to record real voice or to include synthesized voice, to design graphical user interface, and to create appropriate software. The complexity of the problem is discussed in [14].

III. OUR PROJECT

Our project started at SUNY Fredonia. Its initial aim was to design a multimedia dictionary which may help children from certain minority groups to learn English language. Accordingly, the dictionary was planned to be a bilingual one, specifically, in English and Spanish.

Over the time, however, the project expanded by involving collaborators and specialists with other fields of expertise, in particular, language experts from the Faculty of Modern Languages of the University of Elbasan, Albania.

Thus the initial ideas evolved and currently our multimedia dictionary is a true multilingual one, operating with seven languages and providing much more options and opportunities. Various specific features of our work as well as the obtained results are discussed in this section.

A. A Study of User Experience

Many multimedia dictionaries are available nowadays on the Internet or on a CD-ROM. However, our research has shown that none of them seems to be fully satisfactory.

Moreover, while most of the existing dictionaries are mono- or bilingual, our general goal is to design a real multilingual dictionary which will help the users translate and learn several different languages.

As a part of our research, we have interviewed many users of various talking/picture dictionaries, as well as some parents who are familiar with their children's experience. All comments and recommendations have been carefully analyzed and taken into account. For instance, a common remark was that the available dictionaries were only of use to the children after they have learned how to read. To a child that cannot read or is currently learning to read, many of the existing dictionaries are of little use.

Another common drawback is that very often multimedia information (pictures and sound) require several seconds to be downloaded, especially when modem connection is used. People with limited attention spans, as children are, can get disinterested very soon. Therefore, for children's multimedia dictionary reasonable technical questions have to be sought in order to around such kind of problems.

Sometimes details that look quite minor may be of certain importance. For instance, if the word to be explained is displayed together with other information, such as a menu, or a list or pictures of other words, this distracts the child. Another example of this kind is a dictionary using both upper-case and lower-case letters. A child may be confused by the difference of letter appearance and may not understand that, for example, 'D' and 'd' denote the same letter.

In our multilingual dictionary we take into account all these particularities of children perception.

Working on this project, we heavily rely on our experience in web-based distance learning for university students [15, 16] as well as in designing virtual visits of museums and exhibitions [17, 18, 19]. In particular, we take advantage of some authoring tools developed previously by ourselves [20, 21].

B. Purpose and Prospective Users

The designed multilingual multimedia dictionary can be used for various purposes, for instance:

- To teach young children to speak, read, write, and understand their native language;
- To teach both children and adults basic vocabulary of languages that are not native to them;
- To translate words from one language to another. If a user wants to hear or see the spelling of a word that has been displayed, she can do this simply by clicking on the flag corresponding to the language to which she would like to switch.
- As quick reference for travelers while they are on a trip. (The dictionary can run on Windows CE which is the operating system used on most hand held computers.)

The multilingual multimedia dictionary could be also useful to teach young children how to associate objects to sounds, i.e., to learn their first language.

C. Main Features

Some basic features of the dictionary are listed next.

1) The dictionary supports seven languages: English, French, Spanish, Russian, Albanian, Bulgarian, and Turkish. The choice of the first four languages was dictated by the fact that these are among the most popular and important international languages. The last three have been chosen since in recent years these Eastern European countries (among others) are getting open to the Western culture, and as a result the interest in these languages have been increased. We are planning to extend both groups at a later stage.

2) The dictionary has a set of around 1,000 basic words, grouped in six categories: house, barn, zoo, school, store, and fun. (Fig. 3.)

Fig. 3. The main page of our multimedia dictionary.

3) An embedded search engine makes possible to finds a word in seconds.

4) For each word:
- the correct spelling can be seen,
- corresponding definition is provided,
- the meaning of the word is illustrated by a colorful picture,
- real voice pronunciation can be listened,
- typical expression including the word can be viewed.

5) The words are set in large type font, always in capitals.

6) The verbs are in six different tenses.

7) Learning process is supported by:
- 4 multilevel animated word games,
- review exercises,
- word puzzles,
- quizzes for self evaluation.

8) Authoring facilities allow the user to add new words recorded in a special directory of the local hard disk.

9) The users can record a word pronounced by themselves and compare it with the pre-recorded pronunciation in order to track the progress.

10) The dictionary runs in a window, so that one can refer to it when reads or writes with another program, e.g., a text editor.

The dictionary is designed in a way that it is appropriate for children studying a language as a native or as a foreign one.

The child can work with the dictionary by herself, with no help from parents, and can study a language in a more pleasant and appealing manner.

Interface

One of our main concerns was to make the dictionary as user-friendly as possible and indeed the prototype software is very responsive to user input. Some important points concerning the interface are outlined next.

Since the children have limited attention spans, the illustrative colorful pictures are large, simple and clear. Also, all words are viewed in upper-case. The reason is that some

small children which just began to read, can only recognize upper-case letters. While they may be able to understand that 'c' and 'C' denote the same letter, they may not be able to associate 'g' with 'G', for instance.

In order to prevent distraction, the dictionary displays a single image on a page. (See Fig. 4.) This is helpful to provide better association between the word and the illustrative image. Other objects that are presented on the screen (such as navigational tools) will be repeated throughout all dictionary pages. After a short period of time the user will accept these objects as constant and, basically, will ignore them, unless they are needed. The navigation buttons are arrows and icons.
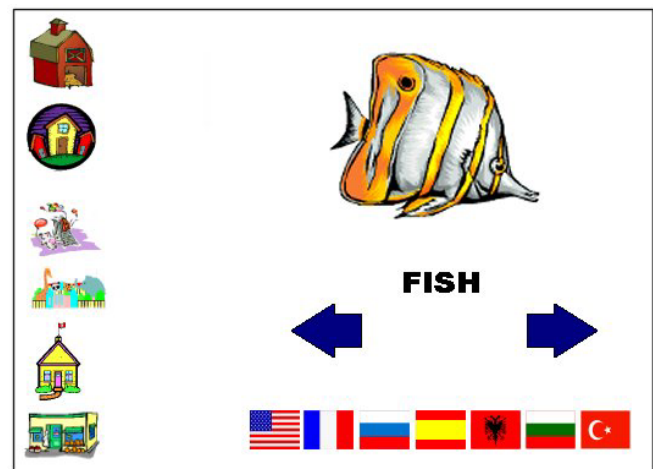

Fig. 4. Sample word page of our dictionary.

The word pronunciation is controlled by the cursor location. When the cursor is placed over an image or the corresponding text, the user will hear a voice. As soon as the cursor is moved out, the sound stops playing.

At each word's page there is an icon menu. The actual display of a word appears in the rest of the screen. The image of the word is centered in the window. The word itself is centered just above the image. Moving to a new word within that same category or back to the previous word is made by navigational buttons placed below the image.

A series of flags at the bottom of the window allow the user to switch to another language. When the user clicks over a specific flag, the dictionary switches to the language spoken in that country.

As already mentioned, our principal aim was to make the dictionary as user-friendly as possible. Many software products require certain knowledge of how computer program has been designed and how it works. For our project, however, in view of the specific children audience, this would be unacceptable. Thus disturbing and distracting operations (like popping up various message boxes or frequently change the format) are avoided.

The proposed user interface is maximally simple and easy to interact with. It can be easily used by a child on her own,

without resorting to the help of the parents.

The First Prototype

The Multilingual Multimedia Dictionary is an ongoing project, as at the current stage a prototype of the dictionary has been created. It is available on a CD-ROM. Currently we are creating supporting educational tools. The final version will be available both on the Internet and on a CD-ROM.

Multilingual Multimedia Dictionary prototype has been developed for IBM compatible computers and it runs under Windows 2000 or higher operating system.

The software has been developed for Microsoft Windows operating system, on Visual C++ programming language using Windows 32-bit API. Some C++ classes have been developed especially for the project needs.

Web-version of the dictionary can be viewed in Internet Explorer or Netscape Navigator. For this version, all data is extracted from the database and is formatted and displayed as a web page.

The program uses three basic databases: image database, text database, and voice database. The text and voice database are split into seven parts, one for each language. All entries for the same word in different languages are saved with the same external name, so that they can be translated immediately. The databases can be easily extended with new words and/or languages.

Since Russian and Bulgarian use Cyrillic alphabet, and all the other languages, except English, have some special characters, we have decided to use Unicode [22] to encode the texts. The pictures are in JPEG format.

The voice of native speakers of the corresponding languages has been recorded. After that the records have been edited in order to split them into several one-word files, increase the quality, and minimize the memory volume.

11) CONCLUSION AND FURTHER WORK

The first prototype of Multilingual Multimedia Dictionary has been developed by a team from the Department of Mathematics and Computer Science, SUNY Fredonia. Experts from Department of Education SUNY Fredonia and specialists on communication and video production have been consulted, as well as language specialists from the University of Elbasan, Albania. The usage of different languages became possible thanks to professors and students on campus that have voluntarily helped with the proper pronunciation of the words included in the dictionary.

The dictionary is expected to be available on the Internet in September 2002. This will make possible to conduct some experiments with users from different countries. We expect to obtain useful information which may let us introduce possible improvements. The dictionary will be extended with new languages and its basic vocabulary will be enriched. The work on Multilingual Multimedia Dictionary started as a student research activity, but later evolved to an ambitious project involving a large number of specialists. It has been recently supported by a Research/Creativity Grant from SUNY

Fredonia and has been selected for demonstration at the Fourth Annual Research & Creative Endeavors Exposition.

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