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Learning Basque in a Distance-Adaptive way

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Abstract: Distance education has experienced a great surge in our society in the past few years. New technological advances have allowed the diffusion of many courses and in a quicker way. Among the scientific advances, we have the creation of the WWW, which has become the information medium with the greatest diffusion, in spite of the fact that it has only been around for a short time. HEZINET is an Adaptive Hypermedia System, which benefits from the advantages of the WWW offering a complete course in Basque for distance learning.

1. INTRODUCTION

The busy pace of life that our current society demands along with the need for continuous knowledge renewal, the lack of free time and the complex schedules have made distance learning the best alternative to traditional learning. Although it is based on an old idea, the new technologies have produced an enormous *"boom"* as regards the tools and mechanisms which support and implement distance learning, providing a greater offer, better quality and a greater level of acceptance among users. The benefits of distance learning through the Web are clear: geographical and platform independence [2]. An application installed and supported in one place can be used all over the world by thousands of students, who only have to be equipped with a computer connected to the Internet. In some

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cases, simple systems can even get better results than traditional learning [13].

A decade ago nobody could imagine that the WWW would acquire the importance that it has nowadays. In spite of the fact the WWW has only been around for a short time, it is becoming an essential medium for communication and exchange of information. This is due to the quick access and the diffusion of information through the *"network of networks"*. In the same way that the technologies for this diffusion are growing by means of the production of new products of higher quality, capacity, speed and lower cost, the number of WWW users is increasing exponentially.

In the past five years many courses and other educational applications have been created in the Web [2]. However, most of them are no more than static pages of hypertext. Most interactive systems for computer-assisted distance learning are based on a hierarchic structure, like traditional textbooks, thus providing specific tools for the domain concerned [11,12].

The barrier which impedes greater success is the lack of adaptation to the user shown in the existing products on the market. From the pedagogic point of view, adaptation to the user is fundamental in education systems. Without adaptation to the user, these systems can be ineffective.

Within computer learning systems we can find Intelligent Tutoring Systems (ITS), Hypermedia Systems (HS) and Adaptive Hypermedia Systems (AHS). An ITS is a software program which tutors the student in a given domain. Described in another way, it instructs the student intelligently [4]. On the other hand, we have HS which present static information without taking into account the knowledge acquired by the students. HS do not adapt to the user, they only present information and they do not receive the user's feedback. HS provide flexibility, but they lack adaptability, whilst ITS are very rigid. AHS have emerged as a mixture of ITS and HS. AHS are not as strict as ITS, and these do not give as much freedom to navigate as HS. AHS provide adaptation to the user mainly in two ways. Firstly, the system establishes appropriate performance levels on the student. Secondly, the system selects appropriate didactic material according to the student's characteristics. An online Hypermedia System is considered adapted if it changes, in some way, with regard to its environment and users [7].

1.1 In this article

HEZINET has emerged with the aim of aiding the distance learning of Euskara (the Basque language, one of the official languages in the Basque Country). In this way, the users can study with a method that adapts to their needs, at their pace and without the need to go to an Euskaltegi (a school where Euskara classes are specifically taught). HEZINET is situated within

the AHS environment for distance learning. Both teaching through an ITS and educational hypermedia systems are combined taking advantage of the advantages of each one and replacing their inconveniences [6]. Although there are a reduced number of potential speakers, about 3 million people, it can be used to develop new distance courses of other languages with a greater number of speakers on an international scale. It is created in a generic way independent of the language to be taught.

The HEZINET project is described in the following sections, presenting its architecture and the representation of the Pedagogic Domain. Its interface is described in detail. A section is also dedicated to showing the adaptation of the system to the student and the role that the human teacher plays in the system. Finally, we conclude by considering some aspects of the current state and future lines.

2. DESCRIPTION OF THE HEZINET PROJECT

HEZINET is a pioneering commercial system for language learning which replaces the deficiencies that were not taken into account in other systems when they were created [9]. Firstly, most of the tutor systems have been designed for research projects. Some of them have been developed but have not been placed on the market, becoming tools with limited use in schools and universities. Secondly, there is an infinite number of multimedia courses, presented as the best option for flexible learning in any area. In these courses the users only visualize large quantities of information, without taking into account their interaction with the system or the knowledge acquired by them.

The system we are presenting, HEZINET, works on two aspects: the use of intelligent software systems for learning and how to adapt these systems to achieve better results. In the following section, the participants of this ambitious project are named, and the architecture and organisation of the Pedagogic Domain are explained.

2.1 Participants

The HEZINET project has been carried out thanks to financial support from the Basque Government (Eusko Jaularitza) and the association formed by a software company (*Ibermática*), a regional newspaper (*El Diario Vasco*), a cultural foundation (*Aurten Bai*), a secondary school (*Ekintza ikastola*) and the Group of Hypermedia and Multimedia (*GH&M*) at the Department of Computer Languages and Systems of the University of the Basque Country. *Ibermática* has been responsible for the development of

the application interface. On the other hand, the *GH&M* at the San Sebastián Computer Science Faculty has implemented everything concerning the Intelligent Tutor part. The educational material has been prepared by *Aurten Bai,* thanks to the support of illustrious and well-known figures in Basque literature. *Ekintza-ikastola* is established as the fundamental piece of the practical validation of the tool. Finally, *El Diario Vasco* has placed the tools and the human resources needed to achieve its promotion.

The lengthy experience of *GH&M* on Intelligent Tutors in the San Sebastián Computer Science has aided the development of this project a great deal. HEZINET is really a continuation of several years of work and study of these systems. It is the result of the group's work on two prototypes, HyperTutor and WebTutor, HEZINET is created with a particular and complete Pedagogic Domain (which the two previously mentioned prototypes lacked) [5, 6].

2.2 The architecture

HEZINET contains two main modules. One provides the flexibility of hypermedia and the other the adaptation to the user. This symbiosis between these modules makes the system more educational. Each one of the parts benefits from the specific functionality that the other one contributes to the system. In this way, the Tutor or Adaptive part benefits from the hypermedia flexibility (the rigidity that normally characterizes a traditional course does not exist). In addition, it benefits from the use of different audio-visual media, which are used to present the domain information to the user, implemented by the hypermedia part. On the other hand, the hypermedia part benefits from the adaptability to the user performed by the Tutor. The *Hypermedia Component* ponders the hypermedia behaviour and is the only part which comes into contact with the student, whilst the *Tutor Component* adapts the hyperspace to the student and performs an evaluation of the result of the navigation.

As shown in Figure 1, the system is organised in six modules: the Interface, the Auditor, the Course, the Student Model, the Intelligent Module and the Human Teacher Module [9]. Whilst the Interface belongs to the Hypermedia part, the other modules make up the Adaptive part (Figure 1), which is the one that will make the decisions taking into account the student's evolution with the system.

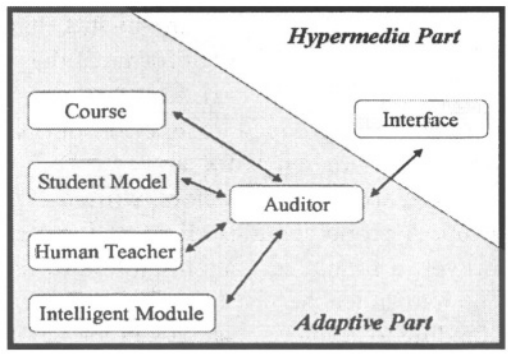

Figure 1. **General architecture of HEZINET**

The *Interface* interacts directly with the students, it gives them the information that the system's Intelligent Module considers appropriate on the spot and it sends information to this Module via the Auditor. The different screens that are shown to the student are created dynamically and are specially designed for each functionality of the system.

The *Auditor Module* is responsible for negotiating the services of the Intelligent Part and it enables the communication between its components.

The *Course Module* manages all the didactic material, provided by the pedagogic experts, which is stored in a database. It also contains all the information on the Pedagogic Domain described earlier.

The *Student Model Module* manages and stores all the characteristics (login name, password, analytical/multimedia...), the learning (concepts acquired, not acquired...) and the materials used for it.

The *Intelligent Module* consults the Student Model and makes intelligent decisions based on tasks defined heuristically using Artificial Intelligence techniques. In addition, it compiles the tests, evaluates the sessions and changes the Student Model according to the results of the tests or the Hypermedia navigated by the student.

The *Human Teacher Module* provides means to carry out the student's follow-up monitoring and to adapt the system to each student in the best possible way.

2.3 The organisation of the Pedagogic Domain

Several pedagogic experts of the Basque Language made a pedagogic structure of the domain [10] as shown in the following figure (Figure 2). The *contents* are the smaller pedagogic units that will be taught, for example: the verbal forms of the present indicative of the verb *izan* (to be). Some of these units work as a key in relation to others. That is to say, some contents cannot

be taught until others, considered to be prerequisites, have been mastered first. For example: before learning the verbal forms of the subjunctive of any verb, the student should learn the verbal forms of the present, past and future. In turn, the contents are grouped in superior units called *work areas, groups* and *families*. There are ten work areas, called: verb, declension, syntax, vocabulary, suffix, spelling, connectors, written expressions, oral and written comprehension. A group contains all related contents that belong to the same area. However, a family of contents refers to related contents all over the domain. The human teacher uses these classifications, for example, to gather exercises leading to common mistakes in the language.

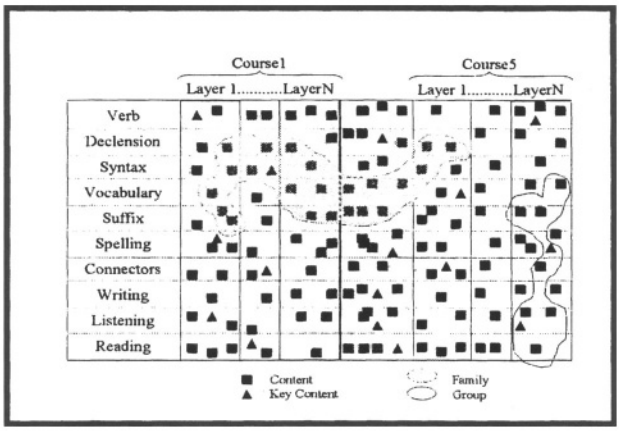

Figure 2. **Graphic representation of the Pedagogic Domain structure**

Besides having a semantic organisation, the Pedagogic Domain also has a functional organisation. The system manages the learning by dividing it into five *courses*. In turn, the courses are structured in *layers* (Figure3). Inside a course, the layers are placed in order, so that the level of difficulty increases progressively. In a layer, a group of contents is presented structured pedagogically by the experts. The contents that are evaluated in the exercises of this layer are the so-called *key contents*. In the same way, a layer is divided in *sessions* (Figure3). A session is the equivalent of a class that a human teacher usually gives in one hour. Inside a session, there are *activities* that the student has to carry out and it is here where the contents presented within it are evaluated. As you can imagine, within an exercise it is very difficult to consider only the contents presented. Therefore, in some cases, previous knowledge will need to be used when doing the exercises, and it is understood that this knowledge has already been learnt.

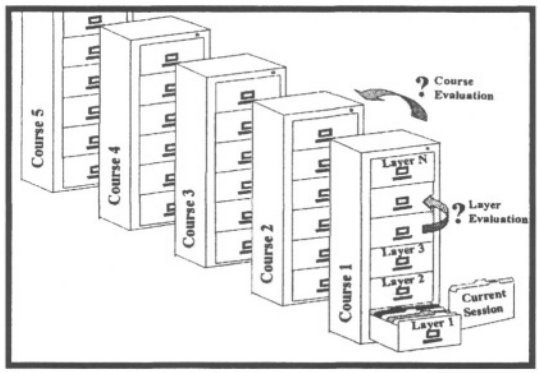

Figure 3. **Representation of the organisation of the Pedagogic Domain**

3. THE INTERFACE

The hypermedia function is to communicate, making the information accessible in a useful way for the user, aiding access to a great quantity of material in a flexible and interactive way [3]. HEZINET uses hypertext to present the information to the students and allow them to "surf" the material they have to learn. The presentation uses different audio-visual media, thus increasing the system's capacity of expression.

As we pointed out earlier, the multimedia component is very important inside the system. For the task of teaching this language, many different types of multimedia resources have been used: video, text and images. Therefore, within each layer there is a video with sound, around which the activities of the sessions belonging to the layer will rotate. By using the video, we attempt to place the student within a context. In addition, for each activity, it can be said that three differentiated parts exist: introduction, presentation and evaluation. The multimedia possibilities are very wide here depending mainly on the type of activity that is being carried out. Twenty different types of activities are defined inside the system [9], which cover all the abilities that a student can develop, such as reading, writing, and oral and written comprehension.

When choosing and presenting activities, the Tutor takes into account the different profiles of the students to select the materials to use. On the one hand, we have the multimedia students, to whom the system presents activities in a more attractive way, requiring greater interaction from them. In Figure 4 (right) we have an example of this type. The introduction is carried out with a sound file, in this case, to later complete the associated exercise, which in this example consists in ordering several pieces of a

puzzle to build a well-formed sentence. The analytical students, on the other hand, are presented with less visual activities; text is normally only used inside them. As we can see in Figure 4 (left), the activity is presented to the user by means of a paragraph of text, in order to later answer a series of questions by filling in the blanks.

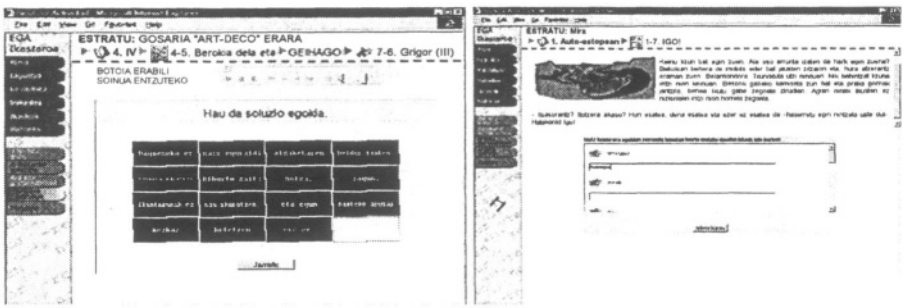

Figure 4. **Examples of a multimedia student activity (left) and an analytical student activity (right)**

4. ADAPTATION TO THE USER

A system is considered adaptive if it is able to make decisions depending on certain information, which changes with time. Adaptive systems are based on two points. Firstly, the student should be able to handle the information available. This is achieved by just presenting the students with the appropriate didactic units, in relation to their characteristics. Secondly, the feedback from the students, with respect to their level of knowledge and assimilation speed, is indispensable to deduce the way to present the new didactic units.

Taking into account the aspects mentioned above, we can say that the HEZINET system adapts to the user. The adaptation can be seen in several places. Firstly, the didactic units are accessed with standard Internet browsers, and can therefore be used at any time from any computer system with a connection to the Internet. Secondly, and as we have already mentioned, users can be classified as multimedia or analytical, and therefore the activities to present are in turn classified in these two types. Thirdly, the system prepares the tests adapted to the concepts seen and acquired by the student. The tests do not generally select items previously used to evaluate that student, and they can require a certain concept already learnt by the student in order to be correctly solved. Of course, in addition, the items can include the already mentioned characteristic of being analytical or

multimedia. Fourthly, when the test of a concept is not passed in the evaluation of a session, a new revision session is created so that the student continues working on it. Fifthly, the system also incorporates a grammar book (hyperized) adapted to the student's level of knowledge, which can be accessed by the student as long as he/she is not completing a stratum test, as these are considered exams.

In spite of the adaptation of the system to the students in the previous points, it can be said that these systems are not complete without a minimum amount of interaction from a human teacher. HEZINET enables a human teacher to complete and assure the successful operation of the system. The human teacher can review the students performance, and modify their Student Model. The human teacher has the possibility of generating specific revision sessions for a student and is also responsible for correcting the activities that the Tutor cannot evaluate automatically, such as the correction of an account or résumé. In Figure 5, we can see a part of the interface that the human teacher uses to make the corrections already mentioned. In this case the teacher (*Irakaslea*), code *irakas2*, is correcting the activity of the student, code *ikasle6*, and the current activity to correct is the *1-6 Itsasorantz*. In this example, the student has written a resume of a text. As we can see in the figure, the solving of the exercise by the student, the exercise instructions and the support document to help the student carry out the activity are presented to the teacher. There are different controls which the human teacher can use to correct the text. In the example in figure 5: crossing out a word, underlining and/or highlighting a part of a text written by the student, indicating that something is missing between the words... The human teacher can comment on each of the mistakes corrected and make observations during the correction of the exercise. In this way, a tool has been obtained which is simple to use, complete and quick at evaluating the activities that cannot be corrected automatically.

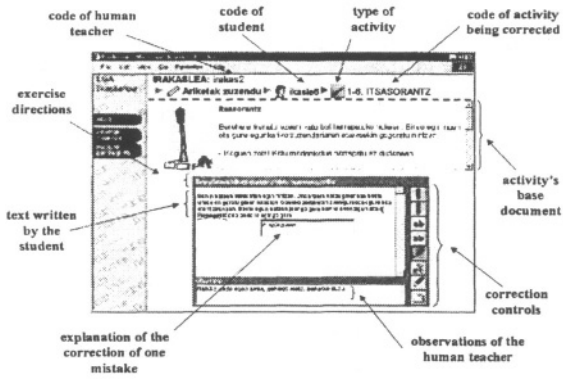

Figure 5: **Correction of activities by a human teacher**

5. CONCLUSIONS

HEZINET is a revolutionary AHS; as far as we know, no other system with the same characteristics is on the market. The main differences of this system compared to others are given by the following series of points. Firstly, HEZINET is a commercial system to learn Euskara; it can be easily modified in order to develop the same function with other languages. The tutoring systems we know of are centred on the introductory teaching of other areas, for example: programming [12], algorithms [8], physics [15], chemistry [14], anatomy [1], etc. It was placed on the market in June 1999, when 150 licences had already been purchased, located in town councils and in an important company in the language teaching sector.

Secondly, thanks to the Tutor part and following the theory of ITS and AHS, the system adapts automatically to each student's needs and capacities, to make learning as suitable and pedagogic as possible for the student. Thirdly, the human teacher can intervene in the follow-up monitoring and in the correction of the student's activities. An expert working as an evaluator of the areas that cannot usually be corrected automatically will enable learning in all the areas of language (both oral and written) and better adaptation as well. Fourthly, all the evaluation tests are created dynamically, taking into account the progression and knowledge acquired by each student. Fifthly, the system is easy to handle and can be used from any computer with a connection to the Internet. Using an intuitive and entertaining medium, the student obtains solid learning and avoids the need to go somewhere physically to study with a non-flexible timetable.

In the design and the development of the tools, special care has been taken to achieve a standard, so that it is applicable for learning any language

or even any subject. This has provided a series of contacts with important organisations which are dedicated to interactive language teaching. The system may possibly be used for learning English and French shortly, thus confirming the success envisaged in learning Euskara.

As future lines, we intend to create a module that will enable the generation of new didactic material and its inclusion in the system using a visual environment. In addition, we are working to make the "surfing" adapt more and providing the system with new tools has not been rejected. For example, the system has only one dictionary, Spanish-Euskara, which can be supplemented with other dictionaries from Euskara to other languages. With which, the learning of Euskara would be aided in different languages, not only in Spanish as at present. In addition, we could incorporate a Chat area, distribution lists, discussion groups... where the students could exchange knowledge and communicate.

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