

## Accessible Language Learning for Visually Impaired People

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### Abstract

*Language competence as a European competence is an important factor for European development. One of the aims of the European Commission is that all citizens of Europe can understand and speak at least three languages. Therefore, language competence is not only regarded as a central element of the understanding among European people, but also as one of the central qualifications for job mobility and job promotion.*

*However, adequate language learning materials for blind and visually impaired people are rare. It is therefore difficult to find and to go to adequate language courses, especially if there are no appropriate training facilities locally available. Computer-based, interactive self-studying courses would therefore be a solution. However, these courses are difficult to use for people with visual impairments. This particularly concerns people who have gone blind in later life since only a smaller portion of this group learns reading and writing in Braille.*

*Facing this challenge, the partners of the Socrates Project "ALLVIP" developed an interactive language learning software for blind and visually impaired people that uses 3D-Sound and a force-feedback joystick for interaction. This innovative approach is used and further developed by two follow-up projects "ELLVIS – English Language Learning for Visually Impaired Students" and "VET4VIP – Vocational English Training for Visually Impaired People".*

## 1. The ALLVIP Concept

### 1.1 Introduction

Language learning materials especially made for blind or visually impaired people are very rare, and if they exist, they might not be up to standard. In print, more up-to-date books do exist, however, they are basically translations of materials that were originally conceived for sighted people and are therefore very much focussed on visual input. And even if Braille books describe the pictures of the black-print edition, they cannot recreate the immediate contact a sighted student would have with the subject.

Computer-based language learning on the other hand provides very good solutions, for example, with phonetic exercises for pupils who do not like to have their pronunciation corrected in class. But most of the software currently available is not accessible for visually impaired students due to the lack of navigation options and the extensive use of the mouse. What is missing is an interactive and accessible user interface designed for visually impaired people. [1]

### 1.2 The Idea

Using a screen reader for audio messages and feedback and the keyboard instead of a mouse are sensible options for a visually impaired user interface. However, activities that provide no problems for sighted learners - like drag&drop or gap-fill exercises - are heavily mouse-based and thus not suitable for visually impaired people. The ideal solution is therefore a haptic or tactile interface that makes cursor movements and objects on the screen tangible. Combining the haptic experience with a 3D-

Sound environment should further facilitate and improve activities with the localisation, orientation and identification of "learning objects".

### 1.3 The Technology

The majority of research into affording visually impaired people access to computers has focused on speech input or output. However, tactile and haptic interfaces offer significant advantages over auditory-based interfaces as they provide the possibility of interacting more closely with the interface than auditory systems do. Tactile devices communicate with users through their sense of touch. A haptic device combines tactile perception with kinaesthetic (i.e., the position, placement, and orientation) sensing. Braille displays and Braille readers are examples of such devices. Another such device is a force-feedback joystick. Originally designed for games, it offers several advantages compared to other devices, e.g., haptic mice:

1. These joysticks are affordable (40-80 Euro) and widely available
2. Some of the joysticks can be adjusted for left and right-handed people and for small and big hands
3. These joysticks work under Windows and are relatively easy to operate
4. Especially for young people, the joysticks provide a "fun part" with the learning.



Fig. 1 Cyborg evo Force Feedback Joystick (photo by Saitek [2])

### 1.4 The Challenge

The idea to develop a language learning software for blind and visually impaired learners using force-feedback joystick was realised in the Socrates project ALLVIP. However, idea and realisation are two very different sides of a coin as the project partners found out that:

- the advantage of the joystick being a low-cost hardware also meant that the hardware was not as precise and easy to control as desired
- being blind is very often a side effect of another illness or problem; so the developers were often dealing with people with multiple disabilities
- the amount of sound files required for information, hints and help for an interactive learning program for blind people was totally underestimated by the project partners
- the amount of testing and fine-tuning required for a user-interface that is designed and constructed by sighted people, but used by blind people takes a lot of time

- the project and the technology involved was new and quite a challenge also for the project partners coming from the schools for the blind,
- there was (and still is) no other haptic learning software available similar to what was planned; thus there was no way to look and learn from any other software practice

### **1.5 The Solution**

As there was no software source, template or previous experience in this area, all partners basically started from scratch and learnt the hard way: by making mistakes.

Although all partners were specialists in their fields - language trainers, multimedia developer, teachers for the blind, accessibility research centre - an interactive language learning software as planned was new to all of them. The only solution was an intensive exchange of experience, the immersion (as best as possible) of the language course developers and programmers into the reality of blind and visually impaired people, and continuous optimism that things will work out.

Software development itself was done in several steps: development and testing of prototypes, design of language course, scripting of language course and recording of audio files, testing of lessons and activities, redesign of user interface and course design.

The course itself and its use in language learning was evaluated by the Scottish Sensory Centre (University of Edinburgh), and by students and teachers from four schools of the blind.

### **1.6 The Language Course**

The English and German language course each contain ten units or lessons. Each lesson centres around a specific topic (like introducing yourself) and consists of several pages or screens.

The screens are arranged in a linear order and the learner can go forwards and backwards either from screen to screen or from unit to unit. It is also possible to go directly to a unit from a main menu. Navigation is usually done by using the joystick buttons.

Compared to standard language learning programmes, the individual pages of the course look empty and featureless. But then, a screen or monitor is not necessary for the course, all information like instructions, help, orientation, or feedback are either done by audio files or force-feedback effects or both. If ever, the screen is more a help to the sighted teacher than for the learner. Indeed, the only tools the learner has to work with are joystick and headset, thus s/he can fully concentrate on the course.

This said, the course focuses on oral language, listening comprehension and pronunciation. To train these skills, the course offers a variety of tasks and activities. These are:

- Dialogue Situations – listening to dialogues including vocabulary and translations
- Multiple Choice – classic multiple choice exercises
- Drag&Drop activities – sorting words and expressions
- Gap-fill – classic gap-fill exercises
- Memory Game – classic memory game
- Recording and pronunciation exercise – listening to words and expression, recording the own voice and comparison
- Virtual rooms – moving in virtual rooms and discovering things
- Grammar – explanations concerning grammar, pronunciation or other topics
- Notebook – acoustic notebook for recording comments

With the exception of the virtual rooms all activities and exercises are pretty common and standard, if not old-fashioned – for sighted people. For blind and visually impaired people to be able to handle and perform these tasks within a learning software is quite a step forward.



The (not fully developed yet) potential of the force-feedback joystick in combination with 3D-sound can be experienced with the virtual rooms. Here the joystick is used to move within a virtual space. These virtual rooms offer game-like, interesting activities that facilitate learning. One unit, for example, contains a virtual flat with several rooms equipped with furniture. The learner can “walk” through the flat, enter the different rooms and discover and “touch” furniture. Orientation is very much done like in the orientation trainings for visually impaired people. Thus, pushing or pulling the joystick lets the learner move forwards, backwards, or sidestep; turning the joystick changes the direction in 90 degree angles. Virtual walls and objects are felt by force-feedback, and 3D environment sounds enhance orientation. A virtual window, for example, constantly emits street noise (traffic, pedestrians, birds singing). The learner can not only identify the location of the window (left, right, back, and with a good soundboard and headset even front and back), but also the distance as the street noise gets louder the more the learner approaches the window. Used in a very basic way, these virtual rooms offer new approaches to learn vocabulary. In a more advanced way, these virtual places can be used to create virtual environments the learner can immerse in to learn a language.

### **1.7 The Outcome**

In general, the ALLVIP concept provides a new and novel way of introducing a language course for visually impaired learners. What is particularly interesting about the project is the use of the haptic joystick. Especially for visually impaired children, this is a new and unknown possibility. The joystick is commonly associated as a seeing aid, it is used for games where the gamer sees the game they are playing. However, with the ALLVIP project, the concept of the joystick has been turned on its head and is used as a significant learning tool for visually impaired learners.

In particular, the ALLVIP project produced three products:

1. a language course “English for German-speaking learners” (level A1)
2. a language course “German for English-speaking learners” (level A1)
3. an authoring system for the development of learning software for visually impaired learners

## **2. Next Steps: ELLVIS and VET4VIP**

As with many European projects, the end results of ALLVIP were not perfect. But the ALLVIP concept showed that interactive learning software for blind and visually impaired people can be produced and thus two follow-up projects were started end of 2009.

### **2.1 ELLVIS**

The Comenius project ELLVIS – English Language Learning for Visually Impaired Students [3] – wants to amplify the innovative results of the ALLVIP project, adapting the English course for young blind learners of other mother languages. Four language institutions and three schools for the blind will work together to achieve these targets: one English course each for blind French-speaking, Italian-speaking and Romanian-speaking children.

The self-learning course therefore has to be amplified, not only adapting it for the different mother languages, but also for the needs and interests of children and teenagers. Apart from that, the project works on the

- Revision and refinement of the data and file structured
- Revision and refinement of the English language course
- Revision and refinement of the audio files and content for German learners
- Add-ons of cultural information
- Improvement of user interface and stability of the software



The course is currently tested by the schools of the blind and will finish in March 2011. The English course itself including all materials for French, German, Italian, and Romanian learners will be available for free.

## 2.2 VET4VIP

If blind or visually impaired people want to learn a language, they face a problem: Usually, they learn a foreign language either as children in special schools for visually impaired or as adults in the framework of a rehabilitation training. If they approach other training centres later in life, they find out that these centres are usually not equipped for visually impaired people. Teachers (of both private and public schools) simply lack adequate training and materials. This is also very true for language teaching.

Most language training materials are based on printed materials or visual information (pictures, whiteboard, beamer, etc.). Audio material is available, but almost always designed as an add-on for books and papers. Therefore, if visually impaired approach language schools, they are usually refused because the teachers neither have training materials, nor are the teachers prepared or trained for coping with visually impaired people. The multilateral language project VET4VIP – Vocational English Training for Visually Impaired People – [4] wants to encounter this problem with a combined package of:

1. a train the trainer course for language teachers on how to deal with visually impaired people and how to use and create teaching materials for this target group
2. adaptable computer-based training modules for business English designed for blind and visually impaired adult learners

To achieve these goals, the partnership consists of adult training institutions, language schools, and schools for the blind. Central to the project is the training technology developed in the Socrates project ALLVIP.

## References

- [1] see "The Allvip Concept" [http://www.allvip.org/prod\\_en.htm](http://www.allvip.org/prod_en.htm).
- [2] <http://www.saitek.com>
- [3] <http://www.ellvis.allvip.org>
- [4] <http://www.vet4vip.eu>