

Session: Special Needs

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Imagine Logo Microworlds for children with special needs

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Abstract

The communication of non-speaking people with restricted moving abilities can only be understood by those who are closest to them. They also wish to have communication with other people, and they also wish to make contact with others as well. For this reason, the use of ICT based on AAC (Augmentative and Alternative Communication and Methodology Center) tools can be a big chance for them.

The Neural Information Processing Group and TeaM Lab at ELTE University have been involved in common research activities with AAC foundation since 2003. The aim of the research is to find alternative hardware and software solutions for communication and further development for children and youth seeking help from AAC services.

In this project the AAC foundation used Headmouse, developed by NIPG group that allows the cursor to be moved by the head movements of the user using a web-cam. In this way, no mouse is needed to control the computer, watching the screen is enough for controlling it.

In the project, TeaM Lab developed 12 different games in Imagine Logo which could be used by Headmouse. The easiest games can be controlled by a single click or by moving the cursor over a big button, after which nursery rhymes or animal sounds are played by the computer and also car games are available for the kids, where they can make the car move by pointing on them.

Keywords

Imagine Logo, augmentative and alternative communication, special needs, Headmouse

4. Introduction

The communication of non-speaking people with restricted moving abilities can only be understood by those who are closest to them. They also wish to have communication with other people, and they also wish to make contact with others as well. For this reason, the use of ICT based on AAC tools can be a big chance for them.

The AAC foundation: „Those, who cannot speak, need different ways to express their thoughts and feelings. One way is using gestures and another is the use of the so called communication board or electronic tools, called communicators. On these equipments, there can be pictures, symbols, Bliss-symbols, characters or words. The Bliss foundation, or so called ‘Augmentative and Alternative Communication and Methodology Center’ helps in finding individual expression forms besides providing complex rehabilitation services.” The Bliss foundation has been operating since 1987 <http://www.c3.hu/~drahu/bliss/> (Hungarian site).

The **Neural Information processing Group** and **TeaM Lab** have been involved in common research activities with AAC foundation since 2003, headed by Prof. habil András Lőrincz. The aim of the research is to find alternative hardware and software solutions for communication and further development for children and youth seeking help from AAC services. This research is done mainly on voluntary basis, though some smaller funds are in cases available.

(e.g. <http://nipglab17.inf.elte.hu:8180/portal/servlet/Main> (Hungarian site).)

5. Papers

Communication where there is a speech dysfunction

Examples for the communications boards:

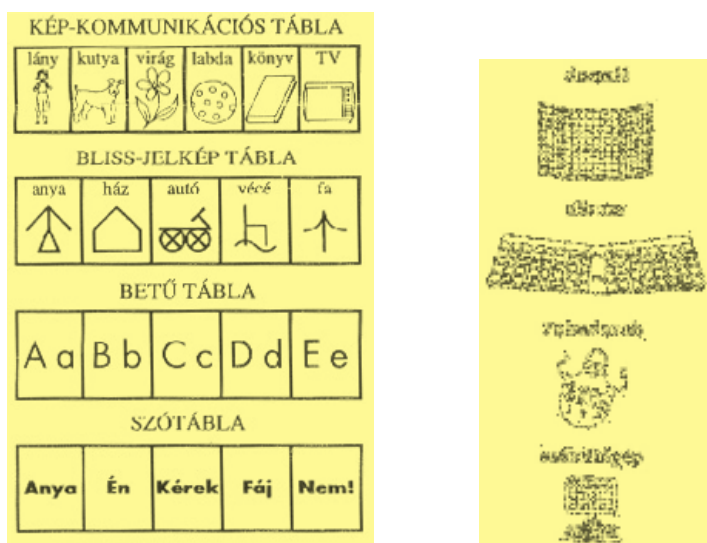


Figure 8. Communications boards

The augmentative and alternative communication helping tool is the communication board. In Figure 1, there are the kinds of communication boards used more often. The pictures, symbols, characters or words shown on the boards are chosen depending on the mental capabilities of the user of the board. The form of the board is chosen practically, depending on how large parts of his surroundings the user can reach for pointing, and what kind of pointing tools he can use.

The need for computers

“Augmentative and alternative communication or "AAC" refers to use of a technology device or system used in addition to or in place of verbal communication. It can consist of gestural

systems (i.e. sign language), low tech visual systems such as an eye gaze board, or high tech "computerized" devices which can have voice or visual output systems." <http://www.speechdelay.com/testrosettaaugmentative.htm>

Beside the communication boards, so called voice producing machines (communicators) are also used. These communicators read out the voice assigned to the pictures on the board.

Since the people using AAC have different skills and abilities they all need different kinds of methods worked out by the helping teacher, conductor. It always has to be done with the help of the AAC user person, and his surroundings. It has to be adjusted to his life situation, expectations and needs. For this reasons the planning of these tools need a long time of thinking and experimentation. Sometimes this part takes weeks or maybe months. If the board is finished, it can not be changed. To change means to make a new board.

Tools that can be personalized and changed easily and tools that are also able to help the communication and movement are very expensive. For functions that are so diversified, computers are needed. The computer as an opportunity is today a part of the life of the students in the foundation:

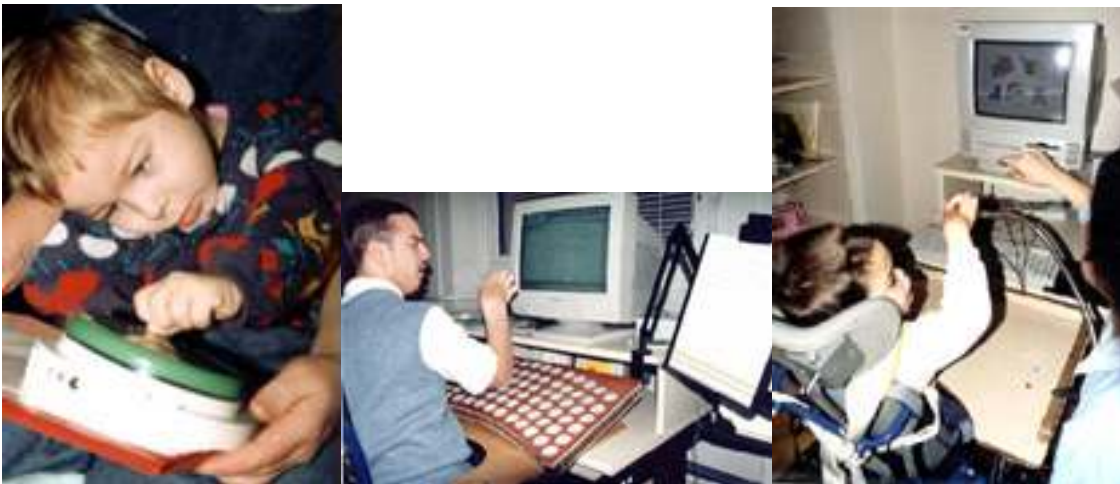


Figure 9. Special control tools

But for someone to be able to use these tools often physical performance is needed, and often there is no suitable software to configure to the possible movements of the users.

The A-KAPOCS

We tried to help to solve these problems with the A-KAPOCS project, where TeaM Lab was involved in game development.

In this project the AAC foundation received some computers with web-cams, and the program called Headmouse, which can be downloaded free from the link below, and which is designed by NIPG in ELTE University: <http://nipg.inf.elte.hu/headmouse/headmouse.html>

This software allows the cursor to be moved by the head movements of the user. In this way no mouse is needed to control the computer, watching the screen is enough for controlling it, so no limb movements are needed for control. This possibility is also cheap, because a normal PC with a web-cam is enough and the software is also freeware.



Figure 10. Headmouse

For these children controlled and precise head movements are hard, so this also has to be learnt, and they need help for this. In these pictures an example is shown of needed head movements for a student to concentrate on one point of the screen:

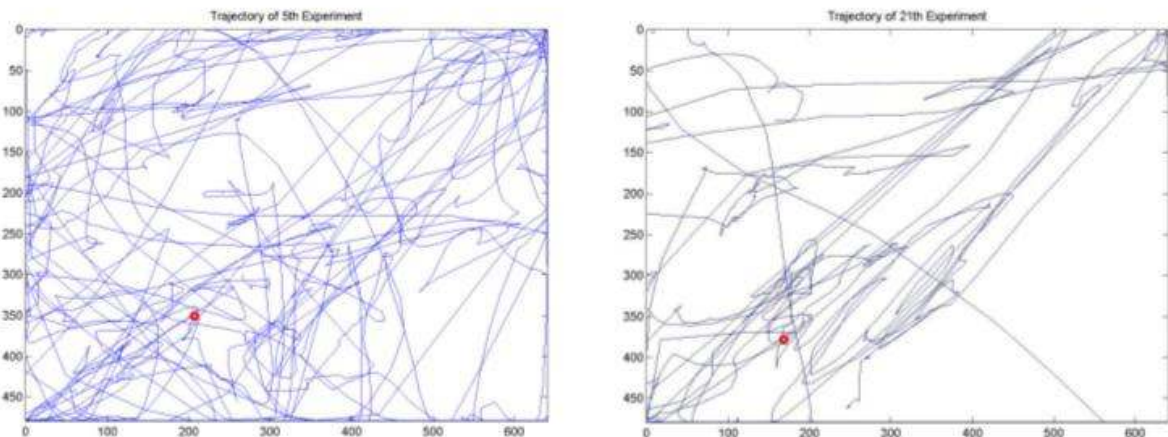


Figure 11. Trajectory of the cursor while playing a game
(The red point is the goal of game)

It is important to know that between the pictures on the left and on the right more weeks of practice was done (so the one on the right is already an “experienced” user).

For making this hard and slow learning process successful amusing games are needed, to ensure continuously success. We had to pay great attention to the fact, that in order to motivate someone to play, we need games that fit into their interest. For this reason we decided to make games with cars, nursery rimes, and drawing tools as well.

We chose Imagine Logo as an authoring tool, because it gave us the possibility to make games easily changeable with different settings. We needed one part of the setting that can not

be set by the children, but can be easily changed by the teachers or parents. And we needed setting that could be set by someone who knows a bit about programming, to be able to personalize the microworlds for the child's visual needs and preferences.

We decided to make different kinds of games. For these, later it will be easy to change the visualizations. For example it is easy to put photos or different kinds of symbols inside. We planned the games so that there are exercise types for different difficulties.

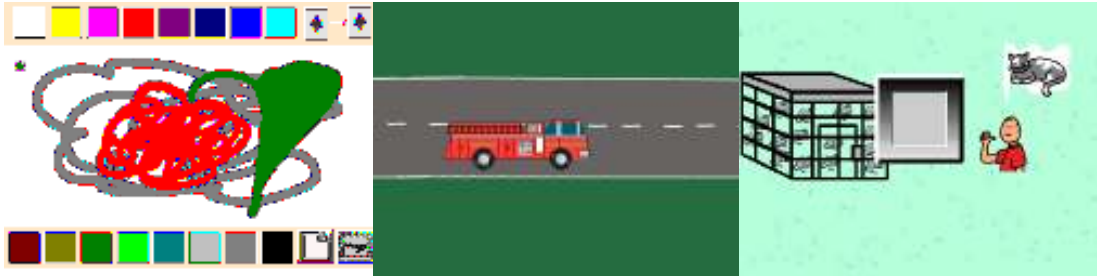


Figure 12. Games witch can be controlled by the Headmouse

Most of the games designed by us can also be used in similar ways already practiced at the foundation, by switches and keyboards. One important reason for this, is that a Headmouse is not the most optimal solution for everyone.

It was also important for these games to be easy, so all the games have to have a large range of settings to be useable for those less talented and configurable to be more challenging for more experienced users too. It should be well adaptable for someone who can hardly point at a button which takes half of the screen, and also for someone who can use on one screen even 20-30 buttons.

In the project we developed 12 different games

The easiest ones can be controlled by a single click or by moving the cursor over a big button after which nursery rimes or animal sounds are played by the computer. Of course car games are also available for the kids, where they can make the car move by pointing on them.

There are also games, where more complex movements are needed e.g. there is a car which is moving only when the cursor is over it. Or in another one, the child has to choose from the small pictures what is to be shown in the big one. These can be seen in the next pictures:

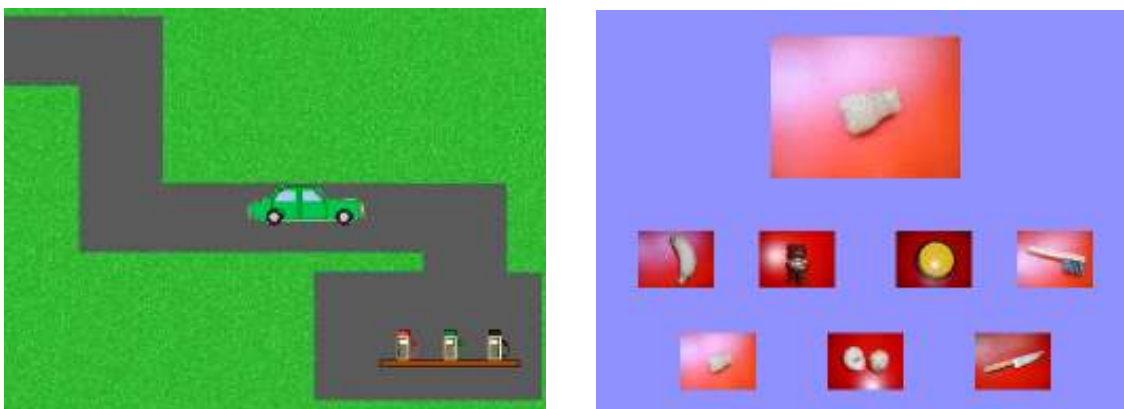


Figure 13. Games for learning to use the Headmouse

Of course drawing games can only be played by students who can already control the cursor very well.

Further opportunities

Those students attending services in the foundation who learn how to control these tools and games, can then further be developed to be able to use more advanced communication tools.



Figure 14. Dasher and Vistab (ICT based Communication's tools)

The Dasher (on the left, <http://www.inference.phy.cam.ac.uk/dasher/>) that gives the opportunity for free text input, and the Vistab (on the right) that follows the structure of the paper communications tables, can be controlled by e.g. head mouse and can convert the text to speech.

Students in AAK foundation can use other developed tools as well that can help them get more independent later. Using a high-resolution camera they can control the mouse cursor by eye movements.

Outcome

The first tests with the Headmouse were made in summer 2003. At this time they had 3 test games, that weren't so funny for the children, and these were hard to use for most of them. After consulting with the children, parents and teachers, 12 games were made in autumn 2003 and spring 2004. So the children could start to use the first games in winter 2003-2004 and more and more games they got in the next half year. Of the twelve persons who were chosen to take place in the experiment, ten children stayed in the program, and two new came in the last one year. Half of them are children between the age of 8-11 and six of them are between 19-39 years old.

All participants used the Headmouse twice a week for 20 minutes every time. It was their choice to choose which game to use.

In May 2005, exactly two years later than the first tests were made six people of the ten who were in the program from the beginning could start as next step using the Vistab. This means, they had learnt to use the Headmouse good enough to be able to start using it as a helping tool.

Of the 6 adults four already a good Headmouse user and only two needs more practice.

It is normal for the children in AAK that they still have problems with communication, and in the institute they are still learning to communicate, and every day they learn new signs, and methods to communicate. So teaching them is hard, because it is common, that the teachers need the help of the parents to be sure, what the answer of the child was. That is presumably the reason why two children did not enjoy learning to use the Headmouse. Except the children, who did not enjoy the work with the Headmouse including the two new one who

came in the experiment, also had success and learnt a lot. The two, who practiced the most, are already able to start to work with Vistab as the adult participants. These two children have played more than twice as much as the other children.

Further developments

Similar method can be the RF mems technology by which they can control the mouse cursor by foot or other body parts, the AIBO or other computer controlled tool that can perform the moves that the particular person is not able to e.g. speaking out what the person wants to say. Our present project deals with such issues.

The NIPG group is also working on an eyemouse for people who can not learn the use of the Headmouse. This software is also now in an early stage of development, but we are already developed the first games to be able to use this tool as well.

We are very much devoted to these developments knowing the impact that these tools can make of children and adults with different deficiencies. Using these tools, disabled people have the chance to live a more independent life than before. However they really need appropriate developments, learning and practice tools. For them, to be an active participant in the society, these steps are essential.

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