The importance of colours and contours in navigation

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I Introduction

Nowadays colour vision and depth vision are widely examined, and comprehensive investigations are dealing with the subject "Design for All". Despite of this, handicapped people are hardly included in these examinations and investigations. As far as can be foreseen, within 20 years at least 18 % of the total population of Europe (currently 450 million) will be deficient (at least 81 million people) [1]. With the help of the interactive multimedia applications I would like to examine how for example colour vision and depth vision influence the navigation of people with different deficiencies; how people with special needs navigate on the screen, in what respect can the transfer of information be influenced by spatial placement of the information on the screen and by using different colours. My goal is to elaborate concrete guidelines for planning user interfaces, which promote navigation and information retrieval of handicapped people.

II Literature overview

From year to year newer and newer softwares are made which can be used easily by people with different kind of deficiencies. For example, an e-mail programme for mentally impaired (MI) persons which works with graphical signs. The experts examined how information on the GUI should be organized such that MI users would be able to use it [5]. The EU World Wide Augmentative and Alternative Communication (WWAAC) project aims to make the electronic highway more accessible to people with cognitive and communication impairments, in particular those persons using symbols instead of text to communicate [6]. For visually impaired persons the design and implementation of a tool was started in 2004, which improves user navigation and remove potential usability problems when reading the Web pages using special devices [4].

In October 1994, Tim Berners-Lee founded the World Wide Web Consortium (W3C) at the MIT/LCS. One of W3C's primary goals is to make these benefits available to all people, whatever their hardware, software, network infrastructure, native language, culture, geographical location, or physical or mental ability. [2-3]

The social value of the Web is that it enables human communication, commerce, and opportunities to share knowledge. W3C pledges to make the Web available to more people around the world. By developing a Web that holds information for both human and machine processing, W3C hopes to enable people to solve problems that would otherwise be too tedious or complex to solve. For this, they are still working on guidelines for Web accessibility, internationalization and device independence. [7-10]

Web Content Accessibility Guidelines (WCAG) explains how to make Web content accessible to people with disabilities and to define target levels of accessibility. Currently these guidelines are organized into four design principles:

- Principle 1: Content must be perceivable.
- Principle 2: Interface elements in the content must be operable.
- Principle 3: Content and controls must be understandable.
- Principle 4: Content must be robust enough to work with current and future technologies. [9]

These guidelines are being developed continuously by the WCAG Working Group, but they are still rather general. They do not contain concrete measured results. In my research I am dealing with navigation mechanism of people with and without any disabilities, and I also examine how visual-audio contrast influences the navigation. For this some worksheets were prepared where navigation can be measured, some of them depending on the visual contrast.

III Worksheets

The worksheets train the understanding of directions (up, down, right, left), as well as of shape recognition; they test spatial orientation and memory too. The following sub-sections show examples of the worksheets.

1 Labyrinth

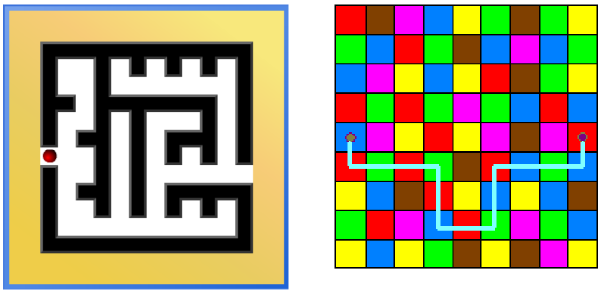

Figure 1: The simple and the coloured labyrinths.

In this submenu a random Labyrinth is generated at every run. The player has to move a figure from the left side of the labyrinth to the right side. If the player reaches the finish, the task is repeated with the mirror image of the labyrinth. The path to be found has strict directionality to the right and contains no loops, because we would like to practice the right direction of reading as well. If the player reaches the finish, the task is repeated with the mirror image of the labyrinth. Only the discovered part of the labyrinth is visible, so the pupil won't lose his way.

Distinction of simple shapes (circles, squares, triangles)

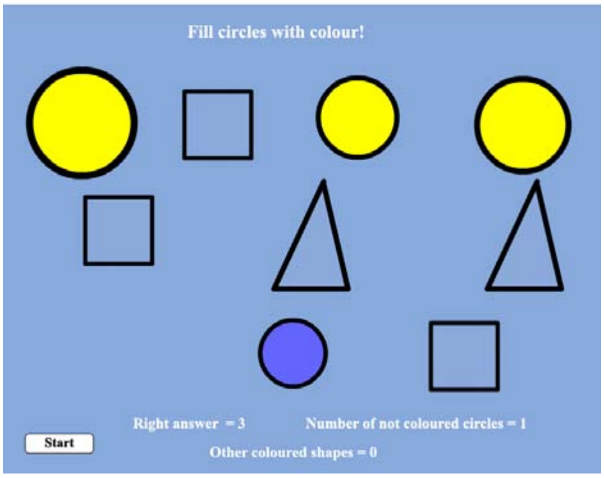

Figure 2: Distinction of simple shapes (circles, squares, triangles).

Firstly circles, secondly squares, thirdly triangles have to be painted. The thickness of the boundary line of the shapes can be set. At the end of the task the program writes out how many circles have been found or not found by the pupil, and how many other forms has he/she coloured.

2 Finding hidden shapes

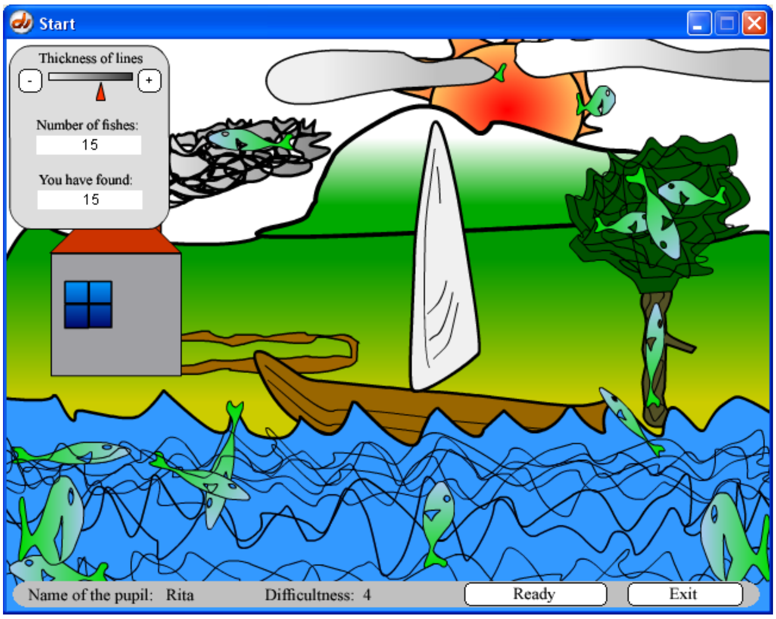

Figure 3: Finding hidden shapes

In this program some objects are hidden among the curved lines, pupils have to find them. The thickness of lines can be set. The same figure has been hidden in different locations. If the pupil clicks one of the figures, it becomes coloured.

IV Results

These multimedia applications are being tested in several elementary schools in Veszprém, with approximately 20 average and 20 mentally deficient children. There are early results from two worksheets. One of them is the labyrinth, and the second of them is the hidden shapes.

The sketch of the labyrinth, together with the rambled and optimal path are saved to an HTML-file. The time of the solution was on the average by 14 sec longer for the mentally deficient children. However there was no difference between the two groups in the time of the solution for the reverse labyrinth. In spite of the fact that there was no fundamental difference between the size and difficultness of labyrinths, there was no significant difference between the two groups, neither in the time of the solution nor in the length of the rambled path.

In the task "Finding hidden shapes" there was no significant difference between the two groups, only the order in which the children found figures differed. For example, the children in the control group found the hard to discover fishes (the fish behind the cloud and the other fish in the tree-trunk) much later than the children who suffer from mental deficiencies. This might be due to the fact that mentally retarded children used an other strategy for seeking for the fishes.

V Conclusion

With the help of these multimedia applications I would like to investigate how some disabilities influence colour vision abilities, and navigation on the screen. With this study I hope to get an answer how information retrieval can be influenced by different colours or locations.

I would like to perform measurements with the help of these programs. Different user interfaces will be compared, too.

Acknoledgement

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