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# Results of Implementation System Management and Drawing for Persons with Special Health Needs

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# RESULTS OF IMPLEMENTATION SYSTEM MANAGEMENT AND DRAWING FOR PERSONS WITH SPECIAL HEALTH NEEDS

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## ABSTRACT

This work has presented and analyzed the results of the system management and drawing for persons with special health needs, using the technology of eye tracking.

The developed software product was tested on ten users. The main goal of tasting was studying several criteria:

- experience using the program, which demonstrates how it is possible to control the functions of the system using vision;
- fatigue of the user, when using the software system.

With the help of this study were clarified the advantages and disadvantages of the developed algorithms:

- the algorithm of the gaze stop;
- key point selection algorithm.

Analysis of the software system revealed that it is problematic to use it in this state, as some users were unable to interact with the system with the help of a glance. They are divided into two categories: users who could not use part of the functionality, users who could not use the system completely.

The work presents the hypotheses of the problems identified during the testing of the software product and options for solving them by changing the algorithms and interface of the system.

**Keywords:** analysis, interaction, key point, gaze algorithm

## INTRODUCTION

In the process of designing the system management and drawing for persons with special health needs, a prototype of the program was created, which covers all the necessary functionality. This software prototype is needed to test the interface and algorithms that provide control of the system by sight.

The implemented prototype of the system was tested on ten users. Before each new test user, the eye tracker, were calibrated. Testing set the following tasks:

- user experience test, namely the ability to control the software system with the help of vision, this criterion includes the management of such system functions as: selecting tools in the menu, drawing the simplest primitive-lines, drawing various primitives, pre-selecting them and the tools that will be used for drawing, in the menu;
- checking user fatigue, this criterion shows how much the user can work with the software system before it starts to make mistakes and vision control becomes problematic.

The results of testing the software system on ten users are displayed in the histogram in figure 1.

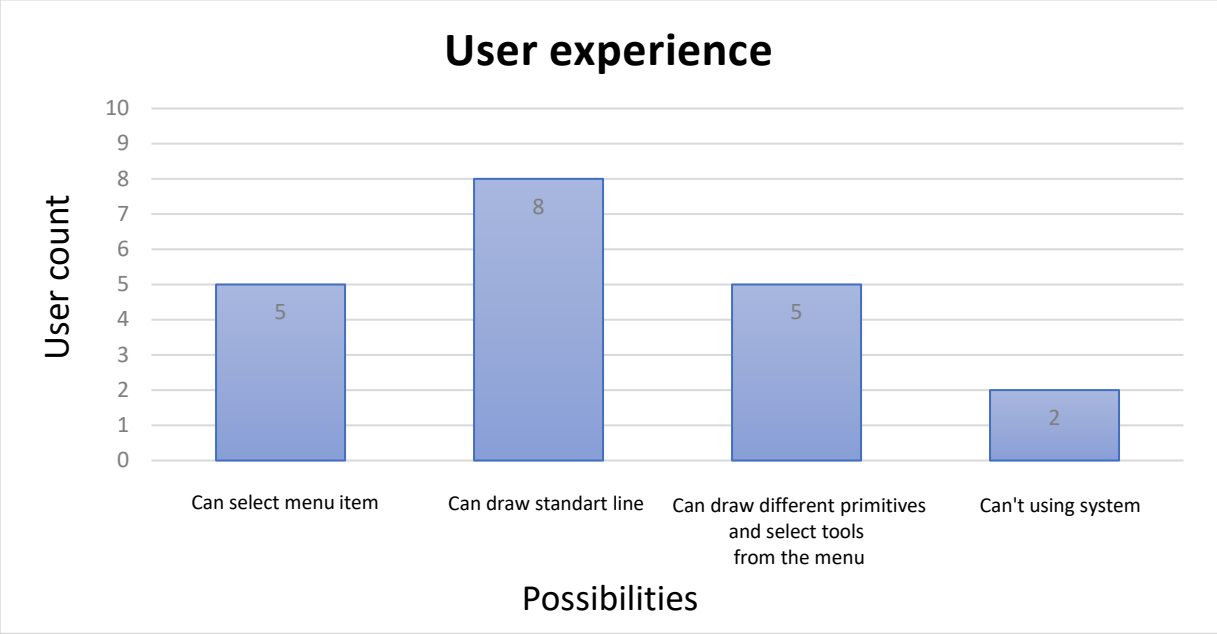


Figure 1. Checking the user experience of the system while managing the functionality with the help of vision

Having considered, the presented histogram it is possible to draw the following conclusions:

- two users could not use the software system because the mouse movement, which was controlled by vision, was chaotic, and users could not focus their eyes on a separate object of the software system, the problem of this behavior is the mouse movement algorithms and the key point fixing algorithm;
- five users were able to select the desired item from the menu of the software system, half of the users were unable to select the desired item, two of them were unable to use the software system completely, the rest were unable to bring control points by looking at the bypassed items;
- eight users were able to draw a primitive, which is selected in the system by default, this number includes all users who were able to select the necessary tool from the menu of the software system;
- five users were able to draw the desired primitive by selecting it and the desired tool from the system menu.

Figure 2 shows an Euler diagram that shows the distribution of users over the ability to control the software system with a glance.

The time that users have spent using the software system is shown in the diagram in figure 3. The higher the time spent in the system, the less fatigue the user has. After looking at the diagram, we can draw the following conclusions:

- users who were unable to use the commands provided by the application to control the functionality spent less than one minute in the system;
- users who were able to draw at least one primitive spent between one and five minutes in the system;

- only two users of those who were able to choose primitives and the necessary tools were able to work in the system for more than five minutes but could not continue to manage the view for more than ten minutes.

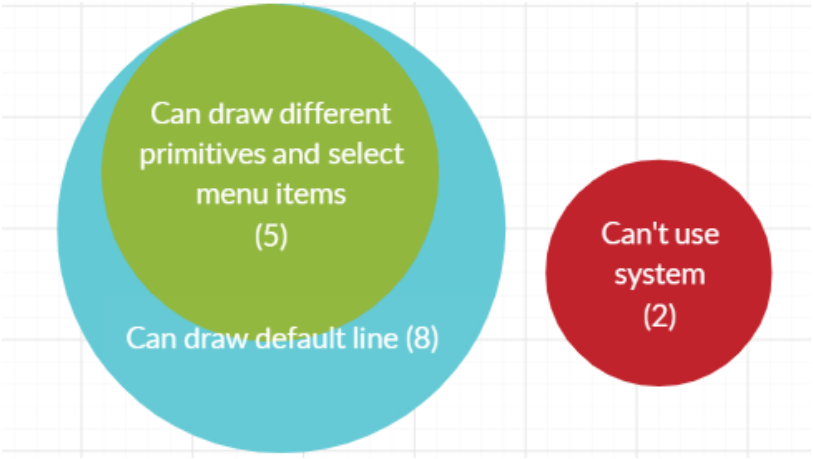


Figure 2. Distribution of users according to the ability to control the software system with a glance

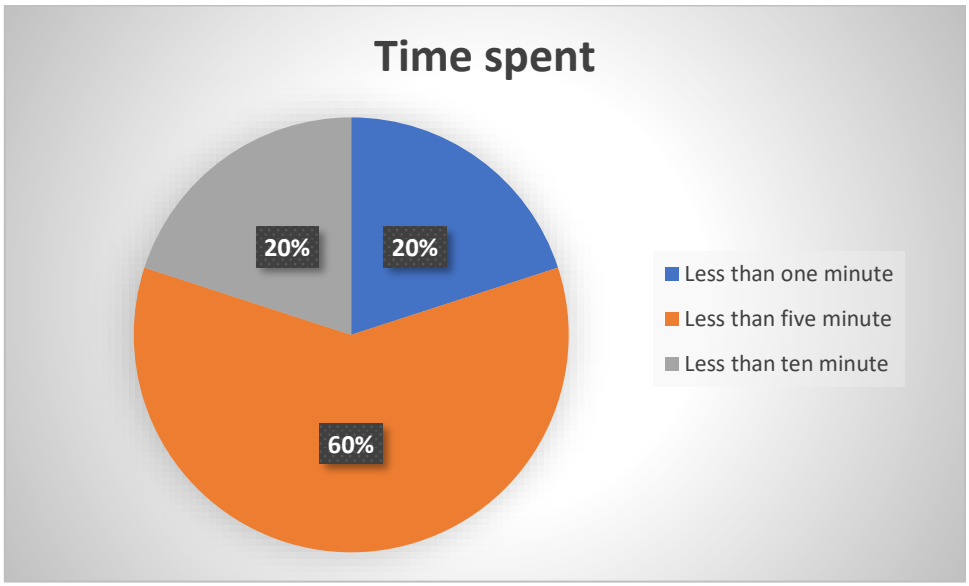


Figure 3. The amount of Time users spent on using the software system Figure 3 – the amount of Time users spent on using the software system

In the process of testing the following advantages of the chosen approach to the implementation of the command system were revealed:

- the system allows 50% of users to select menu items using the direction of view;
- the system allows 50% of users to draw different primitives using the direction of view.

The figures below show the two images that were obtained in the current system (see Fig. 4-5).

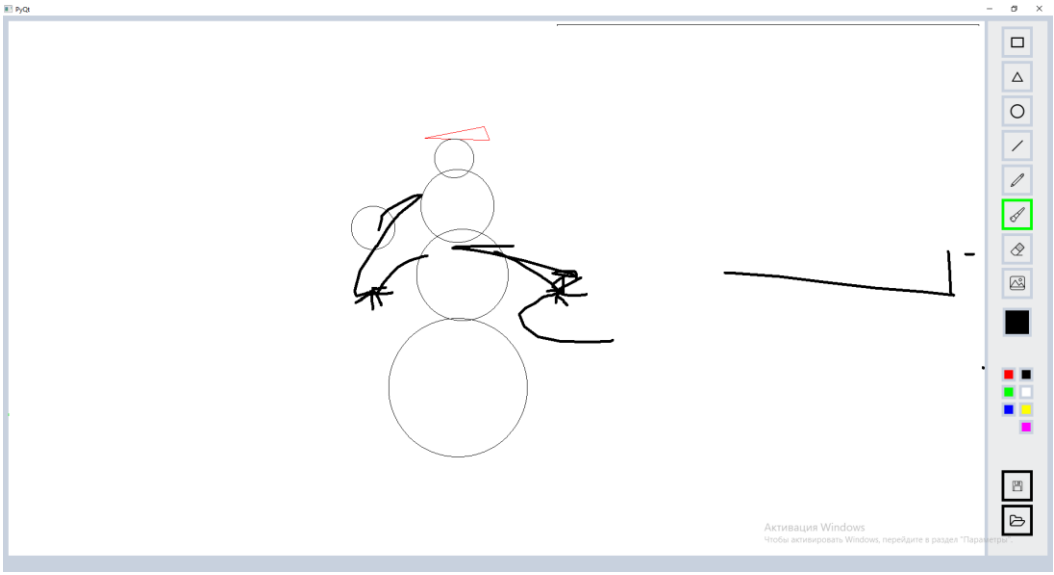

Figure 4. The Image drawn in the developed system

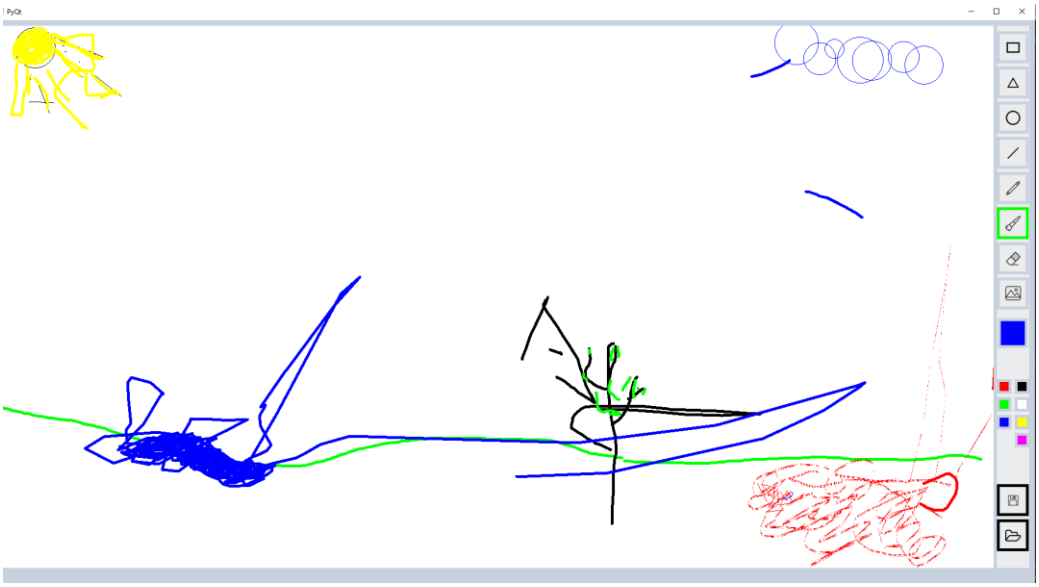

Figure 5. The Image drawn in the developed system

The images show errors in the drawn lines, which occur due to the sharp aversion of the user's gaze.

During testing, the following negative characteristics of the developed prototype were identified:

- the system requires a very accurate calibration in the program provided by Tobii before each user works;
- the system does not provide precise manipulation of the controls for all subjects, in some situations the user had to look not at the very area desired for interaction, and a little to the side, which made continuous work with the program impossible;
- the system does not always allow you to stop looking and select a control point in the desired area;

- there is a situation where the user forgot to select the control point to complete the drawing and looked away to select the next tool, because of this, artifacts (lines) are formed, which can be seen in the figure above.

## CONCLUSION

To resolve the identified problems, must make the following changes to the software system:

- adjusting the speed of movement of the mouse, the mouse should move to a new point is not instantaneous, and smoothly, this approach does not apply to manipulation of the interface, but only necessary in the case of drawing already selected tool;
- if you move your eyes sharply, while drawing, you must select a key point at the last place where the movement was smooth to complete the drawing of the primitive, this is necessary to avoid drawing unexpected lines that can be seen in the previously presented image.
- interface buttons need to be made larger and moved to the edge of the monitor, so that the user can easily select them, taking his eyes as much as possible to the right;
- adjust the coefficient that is used to calculate the stop look dynamically in the process of using the program.

The corrected software product needs to be tested on a large sample of people.

## REFERENCES

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