Guidelines for Designing Touch Interfaces for Controlling Robotic Nozzles in Critical Emergency Situations.

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Abstract. Here goes paper abstract

1 Introduction

The main goal with this paper is to evaluate if color contrast has a significant impact on usability when using a touch screen smart phone application for controlling robotic nozzles in emergency situations. From the results we will suggest four design guidelines to be used when designing applications for similar use or in similar situations. Consumer touch screen devices such as smart phones has increased in amount rapidly recent years and the touch screen technology have made great advances [1]. Since these devices now are available to almost everyone, higher demands on usability needs to be set [2].

Unifire, a company that builds robotic nozzles for water cannons has just introduced a controlling system to steer the nozzles from an application that can run on almost all touch screen smart phones (2015). But the use cases of this application, often in different emergency situations sets high demands on great usability. Defining great usability as fast and low on user input errors. A simplified version of this nozzle control application was modified to be used in these test.

2 Method

In order to be able to test if color contrast has an substantial impact on the usability of a touch user interface we have two versions of the same simplified application for controlling robotic nozzles. The only difference between the two versions is that the first one has the characteristics of low contrast and the second one high contrast. We conducted an A/B test to measure the usability performance of the two versions. The usability performance was measured using two parameters, time and errors.

Time is measured to be able to see if one version is faster.
Errors are calculated to see if one of the versions tend to produce more user error inputs.

2.1 Designing the A/B test

The conducted A/B test consists of two versions of the same application. One high contrast and one low contrast. Both applications are simplified versions of the robotic nozzle controlling application. We simplified the application by exchanging all icons to more basic shapes like square, circle, triangle and a rhomb.

Figure of the two designs here

The application consists of 4 soft buttons, each representing a function. We designed a program to give instructions on a secondary monitor. The instructions was a series of shapes equally to the shapes in the application and the test persons where told to press the representative shape in the application as fast as they could to simulate an stressful situation. If they pressed the wrong button they where told just to continue and press the right one. Both the application and the instruction program are logging timestamps for all input and counting user input errors.

Each version of the application was tested on [NUMBER PLACEHOLDER] persons all within the same age group (20-30) and with a variety of backgrounds.

2.2 Evaluation of the A/B test

This section will in short describe the evaluation process of the A/B test. How the test results were collected and what parameters we have had focus on during the test.

3 Result

All results produced from the tests are here presented with clear numbers, conclusions and figures/graphics.

3.1 Evaluation

The evaluation itself and a text about the evaluation results.

4 Discussion

In this section we will discuss the results from the tests. We will discuss what the results mean and how they should and could be interpreted.

4.1 Conclusions and Guidelines

Here we will present our conclusions based on the resulting outcome from the tests. We will also present our four guidelines on how to design a touch interface compatible for emergency situations. These guidelines will be created based on the test results.

4.2 Drawbacks and Limitations

This paper should not be used as a scientific foundation for any kind of argument. There are to many parameters affecting the results. Time limitation during the research period had a big influence on the credibility of the whole paper. We would like to emphasize some of the biggest drawbacks in the research and the paper by listing them below. *Note that it is highly possible that there exists drawbacks not mentioned here.*

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4.3 Future Work

Due to extremely limited time given for this paper there are many things that could be improved, made differently or simply just continued to be worked on. We have some concrete suggestions that could be a case for future work.

- Extend the test group with more subjects. The patterns that slightly appeared in our results could with a bigger test group be more significant.
- Make the same tests but with a better simulation of an emergency situation. Our proposal to this is to stage an emergent situation and make the test person interact with the complete situation.
- Our collected test data can be downloaded and used freely to investigate other aspect not mentioned in this paper. One proposal is to look at the different shapes and try to detect possible error patterns between them.

References

[1] Jennings, A., Ryser, S., Drews, F.: Touch screen devices and the effectiveness of user interface methods. In: Proceedings of the Human Factors and Ergonomics Society Annual Meeting. Volume 57., SAGE Publications (2013) 1648–1652
[2] Paredes, H., Fonseca, B., Cabo, M., Pereira, T., Fernandes, F.: Sosphone: a mobile application for emergency calls. Universal Access in the Information Society **13**(3) (2014) 277–290
[3] Sax, C., Lawrence, E.: Point-of-treatment: Touchable e-nursing user interface for medical emergencies. In: Mobile Ubiquitous Computing, Systems, Services and Technologies, 2009. UBICOMM'09. Third International Conference on, IEEE (2009) 89–95
[4] Wu, J.H., Yuan, Y.: Improving searching and reading performance: the effect of highlighting and text color coding. Information & Management **40**(7) (2003) 617–637
[5] Gong, J., Tarasewich, P.: Guidelines for handheld mobile device interface design. In: Proceedings of DSI 2004 Annual Meeting, Citeseer (2004) 3751–3756
[6] Jørgensen, M.: Software quality measurement. Advances in engineering software **30**(12) (1999) 907–912

[7] Norman, D.A.: The design of everyday things: Revised and expanded edition. Basic books (2013)
[8] Hoober, S., Berkman, E.: Designing mobile interfaces. " O'Reilly Media, Inc." (2011)