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

Albin Hübsch

Department of Computing Science
Umeå University, Sweden
id11ahh@cs.umu.se

1 Introduction

Introduction part will contain a purpose of the paper and a motivation for why the paper was made.

Purpose Can a well designed touch interface with differences in color contrast for controlling robotic water cannon nozzles reach a lower level of faulty interactions in emergency situations.

Motivation In critical emergency situations, like in the case of fire, a graphical touch user interface should not be the weak link on getting the job done when controlling robotic water cannon nozzles. One wrong push of a touch screen button in the interface can be the difference between life or death.

The main goal with this paper is to evaluate if increased color contrast in a touch screen interface for controlling robotic water cannon nozzles can result in fewer faulty interactions, compared to a low contrast touch interface, in emergency situations. And from this we will present four guidelines on how to design a good touch interface for emergency situations. These guidelines will be useful for anyone designing touch interfaces made for demanding situations.

2 Method

In order to be able to test if increased color contrast has an substantial impact on the usability of a touch interface we will design two identical touch interfaces for controlling robotic water cannon nozzles. The only difference between these interfaces will be the color contrast. When designing the touch interface we will follow guidelines defined in the found references. Later these two interfaces will be tested by an A/B test. The test will then be evaluated to produce a result and a conclusion and finally form our four design guidelines.

2.1   Design of an A/B test

In order to test if increased color contrast can lower faulty interactions in a touch interface an A/B test will be developed and performed. Two identical applications, despite differences in color contrast, with just a few touch screen buttons will be measured against each other. We will measure both time and amount of errors it takes to perform each given task. The test persons will be told that there is a time limit and they have to do it as fast as they can in order to simulate an emergency situation. Instructions will be given on a secondary screen so that every test is consistent.

This section will contain a short but descriptive text about how the A/B test was prepared, built and performed. It will describe who participated.

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

Present drawbacks and limitations with both the used method and the produced results. Time is limited, therefore a bullet proof test can not be performed which means the results will somewhat be limited in credibility.

4.3   Future Work

Due to the limited time we have on this paper there will be a lot of things that can be improved. We will in this section give our suggestions on things that could be done in future or continued work.

References

[1] Jun Gong and Peter Tarasewich. Guidelines for handheld mobile device interface design. In *Proceedings of DSI 2004 Annual Meeting*, pages 3751–3756. Citeseer, 2004.

   Good paper containing proposed design guidelines for mobile devices. It discuss limitations with mobile devices compared to desktop environments that has been around for a much longer time.

[2] Steven Hoober and Eric Berkman. *Designing mobile interfaces.* " O'Reilly Media, Inc.", 2011.

   Book that gives a deeper look into designing mobile interfaces. A lot of inspiration and good work practices with things to do and not to do. Also general guidelines for designing mobile interfaces are presented.

[3] Anthony Jennings, Spencer Ryser, and Frank Drews. Touch screen devices and the effectiveness of user interface methods. In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, volume 57, pages 1648–1652. SAGE Publications, 2013.

   Report examining how different methods for completing tasks on touch screens with different sizes. Scrolling and zooming with different methods are tested and evaluated with errors of action and time as parameters. The report provides some design guidelines at the end.

[4] Magne Jørgensen. Software quality measurement. *Advances in engineering software*, 30(12):907–912, 1999.

   An article that examines possible ways of measure software quality. A lot of theories on software quality measure.

[5] Donald A Norman. *The design of everyday things: Revised and expanded edition.* Basic books, 2013.

   An old classic. A lot of useful tips and guidelines on how design works in everyday things. Will be used when the guidelines will be formed.

[6] Hugo Paredes, Benjamim Fonseca, Miriam Cabo, Tania Pereira, and Filipe Fernandes. Sosphone: a mobile application for emergency calls. *Universal Access in the Information Society*, 13(3):277–290, 2014.

   This paper includes a very interesting evaluation process were they evaluate a SOSPhone prototype made for use in emergency situations.

[7] Christian Sax and Elaine Lawrence. 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*, pages 89–95. IEEE, 2009.

   This paper runs through the process of how they designed a e-nursing application with a user interface especially made for emergency situations. The paper also investigates how the touch screen UI performs.

[8] Jen-Her Wu and Yufei Yuan. Improving searching and reading performance: the effect of highlighting and text color coding. *Information & Management*, 40(7):617–637, 2003.

This paper investigates how colors and highlights affects read performance. They tried different color combinations, various luminosity in background and foreground and hue combinations. With highlighting they tried colors, reverse video and blinking. Based on the findings in their paper they propose some design guidelines.