KINECT KIOSK USER EXPERIENCE EVALUATION

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ABSTRACT

In this paper we present an evaluation of Kinect Kiosk user experience. We have created an example of evaluation system where users can decide which parameter values of the user interface are suitable for them. Our example shows how we can collect user feedback in form of voting system to adapt the user interface for average user. Such setup also allows user profiles that can store the information of user interface preferences for an individual user. The presented evaluation of touchless interfaces is novel and shows how user interface designers as well as user experience designers can create better user interfaces by using presented evaluation.

1 INTRODUCTION

In recent years more and more touchless systems are emerging that allow a novel user experience. Devices such as Microsoft Kinect, Leap Motion controller and others allow users to interact with systems in different ways. A new kind of an interaction, triggered new interface designs adopted for touchless interaction. While most actions in such interfaces are simple and rely on moving the cursor on a screen by moving a hand and selecting or clicking buttons with hovering over them or making certain gesture with a hand (close the palm of the hand), less attention was given to adapting the user interfaces for different setups of such systems. Using a Kinect sensor might be satisfactory in combination with big screens or even projectors, however it is surely not satisfactory with small screens. The problem is that graphical user interface (GUI) components do not adapt for different screen sizes which results in unusable applications due to too small fonts, images, buttons, and other components.

A lack of evaluation studies led us to try implementing our own evaluation interface for presented interface. We have relied on an user-centered user study where user can choose what best suits his needs. One of very important points of touchless interfaces is that they usually have to be well adjusted for individual user which results in storing user profiles for groups of users or even individuals. Such profiles can be set in advance according to basic parameters of individual system and current user.

In the following section we present the related work on evaluation of interfaces and on touchless interfaces. In Section 3 we present our evaluation interface and in Section 4 we present an use-case with Kinect kiosk. We discuss whether such framework implementation and its usage is meaningful or not in Section 5. At the end we point out the possible future extensions of presented framework and its future use in the final section.

2 RELATED WORK

An evaluation of user interfaces has been done since early beginnings of user interface design. Questions on how and if we can measure usability were discussed in 1980's [4] and early 1990's [1]. Several attempts on how it can be done were developed in following years when IBM research presented the questioner evaluation method developed and described by Lewis in [8]. In presented method researchers have presented use of the developed method on several use-cases.

During same era Nielsen has presented several papers on usability engineering and improvement of human computer interaction. Heuristic evaluation of user interfaces as an informal method of usability analysis was presented in [11]. Later Nielsen also presented how can such method be used for finding usability problems in applications [9], later incorporated in a book [10].

Many usability studies of mainstream user interfaces were conducted. A comparison of usability methods for interactive health technologies is presented in [7]. State-of-the-art in automating usability evaluation of user interfaces is presented in [6]. The article presents which aspects of usability studies can be automated and to what extend. Some evaluation studies were also performed on touchless systems [2]. In the work authors present a gesture controlled user interface and evaluative study of its usability.

We use user-centered user interface evaluation as a base for implementation of presented evaluation interface. An example of using user-centered user design and evaluation can be found in [5]. An adaptive use interface and its evaluation is presented in [12].

While presented literature covers many aspects of user interface evaluation none has presented an automated user-centered evaluation of touchless interfaces which is presented in following sections. System which use new kind of interfaces such as Microsoft Kinect or Leap Motion were not yet evaluated in a described manner. In following sections we first present our approach to automated user-centered evaluation of touchless interfaces and later on present an use-case with the Kinect kiosk.

3 EVALUATION INTERFACE

While designing the Kinect kiosk system we have faced several important decisions on what parameters to use while designing kiosk user interface. Such parameters are font size, image size etc. We also had an idea on using known user parameters - its height and distance from screen - as well as of actual system - size of screen and it's resolution - in defining an user interface adapted for individual user. To create such system one must make sure that it will fit end-user expectations and will be easy to use, which suggested using user-centered evaluation during development.

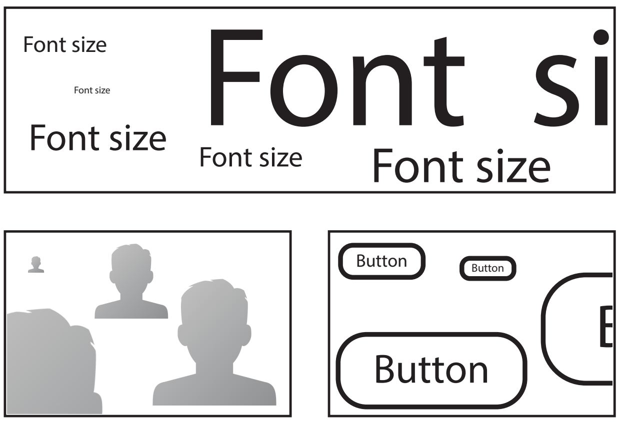

Figure 1: Selected user interface parameters.

3.1 Defining evaluation parameters

Throughout the development of our system we have isolated a small set of parameters that are crucial for defining a good usability. These crucial parameters are (also presented in Figure 1):

- **font size** - which defines font sizes for all parts of interface including titles, buttons, content font size and others;
- **image size** - which defines the size of images showing individual elements that user should be able to recognise at the using distance;
- **button size** - which defines the size of the button which user has no problems selecting/clicking;
- **click duration** - which defines the time period user has to hold a cursor over an user interface element, such as button, for interaction action, such as selecting or clicking.

If the above user interface parameters are set properly for individual user we increase usability of such system as well as improve systems user experience. Defining the best values of presented parameters for individual user is a problem we cope next.
If we want to optimise the selected parameters we have to know some properties of the system presented in Figure 2. For usability study we have to know the physical properties of the system, such as screen size, screen resolution and distance to user. According to these system properties we can try optimising the parameters of user interface.

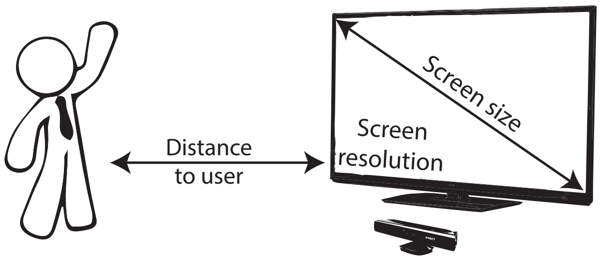

Figure 2: Relevant system properties.

We have decided to use user-centered user interface evaluation for optimising the above mentioned user interface parameters according to known physical properties of the system. To perform such evaluation we have designed a dedicated assessment system, described in following section, where users were able to select a preferred setting for an individual user interface parameter.

3.2 Assessment system

Assessing the optimal values of parameters led us to development of dedicated assessment system. We have designed a system in form of nonlinear wizard, presented in Figure 3, where user can decide which parameter to optimise next. The system records users values for individual parameter in a file. After completing all the tasks (or just few of them) user, can conclude his selection and allow new users to assess the user interface.
Each individual step of wizard presents optimising the individual user interface parameter. In case of font size, the system displays several options of font sizes and user selects the best suited one for reading longer content. User selects his choice by hovering over the preferred example. Optimising other parameters is similar except for parameter of click duration. In case of click duration the user is presented with several choices of click duration in form of boxes that switch

a color on successful interaction. When an user decides on best duration he selects the choice.
All the data is stored in a file immediately after action to prevent possible data loss if the system crashes. Users also do not have to fill-in questionnaires after the experiment since their feedback is already collected by assessment system.

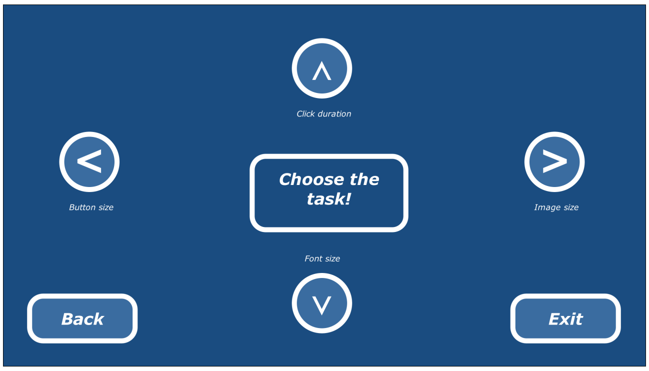

Figure 3: Assessment system.

4 EVALUATION OF KINECT KIOSK

As an use-case we have conducted user testing on Kinect kiosk presented in [3]. The Kinect kiosk is a system dedicated for kiosk presentations with use of Microsoft Kinect sensor. It also consists a web kiosk framework for content display and deployment. A case study was conducted at SIRikt 2013 conference. Users were high school teachers of different age and background. The actual setup consisted of large scale television with diagonal of 42" and screen resolution of 1280 by 720 pixels. System was used at distance of 2.5 meters. Testing conditions were real-life like due to numerous people grouping around the set-up and trying interacting with the system.
The main goal of evaluation was to determine the values for previously mentioned set of user interface parameters. We have obtained feedback from 21 users. Some users have skipped some parts of testing for various reasons (such as lack of time, lack of interest, etc.). Users also performed tests in various order, some even repeated the individual steps of evaluation.
In the step of selecting the appropriate font sizes system displays 6 boxes containing a text with different font size ranging from 8 to 36 pixels in size as shown in Figure 4. Users task is to select the box where the content has his preferred font size. Image sizes ranged from 48 to 192 pixels, buttons sizes range from 64 to 256 pixels and click durations range from 0.1 to 3 seconds. There were also 6 choices for selecting the preferred value of other user interface parameters. All the values for user interface parameters are presented in Table 1. Parameters are dependant on physical properties of the system. Parameters for size are presented in screen pixels

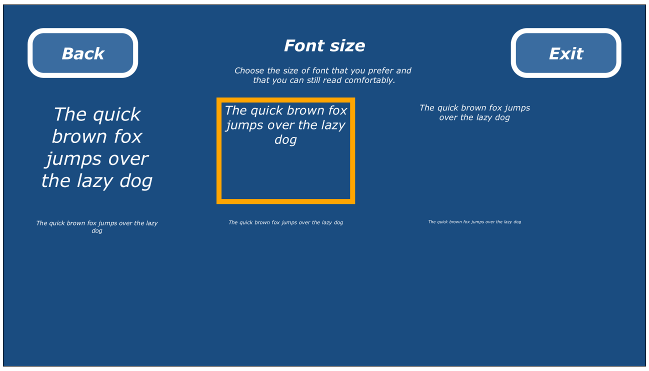

Figure 4: Assessing font size parameter of user interface.

(px) while parameter values for click duration is presented in seconds.

case	font size	image size	button size	click duration
1	36 px	192 px	256 px	3 s
2	24 px	160 px	160 px	2 s
3	16 px	128 px	128 px	1 s
4	12 px	96 px	96 px	0.5 s
5	10 px	64 px	72 px	0.25 s
6	8 px	48 px	64 px	0.1 s

Table 1: Values of evaluation parameters.

4.1 Evaluation results

With the use of collected data we have chosen the values of user interface parameters that best fit the average user for use with Kinect kiosk. The user selected values for user interface parameters are presented in Table 2. The table shows cases selected by users according to values in Table 1. The "-" value shows where users did not complete certain step of evaluation.
According to the results we have calculated the value for individual user interface parameter. For size parameters we round the value to integer value, for time parameters we round the value to one decimal place. Obtained parameter values are presented in last row of Table 2 (*calc*).

5 DISCUSSION

While presented approach still incorporates separate evaluation and parameter setting for individual system it is still one of few approaches for evaluation of touchless systems. While there are more affordable touchless systems arriving to the market more usability studies and evaluations have to be conducted for their improvement as well as for integration in end-user products such as Kinect kiosk.
Presented work shows first step towards development of automatically adjustable user interface for touchless devices that will take into account physical properties of the system and will adapt according to user interaction success.

user id	font size	image size	button size	click duration
1	24 px	128 px	72 px	0.2 s
2	24 px	128 px	72 px	1 s
3	16 px	96 px	96 px	0.5 s
4	24 px	128 px	96 px	1 s
5	36 px	160 px	72 px	0.2 s
6	24 px	128 px	-	-
7	12 px	96 px	96 px	0.5 s
8	24 px	96 px	72 px	1 s
9	24 px	128 px	72 px	0.5 s
10	24 px	160 px	96 px	1 s
11	36 px	48 px	160 px	2 s
12	12 px	128 px	128 px	0.5 s
13	16 px	96 px	96 px	0.5 s
14	16 px	128 px	96 px	1 s
15	12 px	96 px	72 px	1 s
16	24 px	128 px	128 px	0.5 s
17	24 px	128 px	-	1 s
18	12 px	96 px	96 px	0.5 s
19	-	160 px	96 px	0.2v
20	16 px	128 px	96 px	1 s
21	16 px	96 px	96 px	0.5 s
calc	**21 px**	**118 px**	**95 px**	**0.7 s**

Table 2: User selected values of evaluation parameters and their final calculated values.

It shows that there are still possibilities of extending and adapting the HCI systems for individual users or groups with same physical properties or even storing settings for individual user. Personalizing the system can be achieved by recognizing user with matching physical properties, face recognition or even combination. Other possibility is integration with speech recognition as well.

6 CONCLUSION AND FUTURE WORK

We have presented how an automated user-centered evaluation system can help in designing better touchless user interfaces that are adjusted for broader use and are adapted for individual usage according to the physical properties of implemented system. A use-case shows how the proposed approach was applied to Kinect kiosk system.

Such an approach can be used for determining other user interface parameters such as sizes of other user interface components, color-scheme selection, etc. It could also be used for on-the-fly adaptation of a system that is already used in practice. One could adjust the parameters of user interface according to the responsiveness of user and his reaction times for individual interaction tasks. Systems could also adjust user interface parameters according to the distance between user and the system.

One other possibility is storing user profiles and identifying users with face recognition and other user properties. In such scenario a system would select preferred user's settings as well as adapt his profile for even better user experience.

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