An insight into human-computer interaction research methodologies

COMP210 - Interfaces and Interaction

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1 Proposal

This journal addresses the research techniques to be used in the assessment of the user interface for the 3D modelling program *Genesis*. This research of the various usability testing methodologies, will inform which one could be used to test the interface's efficiency in various domains, including:

- The time it takes for a user to find an item or feature of interest

- How quickly a user may find an unfamiliar or advanced feature

- Whether any confusion is encountered whilst looking for a feature

- Whether it is intuitive based on a 3D modeller's expectations

- Whether there are any significant errors encountered

- Whether the user is aware of how to handle such errors

Some of these elements may be easy to measure quantitatively. Others may lend themselves to qualitative questionnaires, or A/B variants to test efficiency. However, while the source code of the application is freely available, it is unlikely that the changes could be actioned during the testing phase due to a lack of resources and time.

2 User testing methods

2.1 Eye tracking

Eye tracking involves monitoring a user's eye movement to broadly determine their focus of attention. [1] It traditionally uses a costly specialised camera, making the method less accessible outside of lab scenarios [?], thereby restricting the demographic range of subjects. However, recent developments [2] [3] have managed to achieve similar effects with low-cost portable IR cameras. Additional developments in the field of VR suggest that eye-tracking may be a widely accessible strategy in the near future.

In HCI analysis, eye tracking takes advantage of the theory that eye movement and fixation directly correlates to the user's interest. [1] Specialised tools can then record and visualise the user's area of focus in a heat map which provides a visualisation immediately depicting areas of interest. However, this is unlikely to be useful alone, and a more detail recording of the path of a user's eye focus may be more substantial [4].

2.2 A/B testing

TO READ: [5]

A/B testing is historically interesting in the fact that the subjects of an A/B test are not necessarily aware.

A/B testing is useful in that it can help identify the actual efficacy of a design with minimal bias. However, it can still be influenced by the choice of demographics for each group. Furthermore, the sample size required to identify a trend (and therefore a

preferred strategy) is quite large, and after the fact, A/B testing does not necessarily offer a solution for further improvement of the trend.

2.3 Surveys, interviews and bias

For a designer to get specific answers to their questions about their design approaches - such as how effectively it works - they may be tempted to ask the users directly. **Interviewing** and **surveying** are two methods of data collection wherein a user is asked a specific set of questions about their experience on a topic.

This method, however, is strongly impacted by bias. Several sources of bias, such as: the demographic difference between a voluntary respondent and a non-respondent; motivational influence of the interviewer; language and cultural differences; social desirability bias (especially on sensitive topics [6]); and even the order of questions [7]. Many of these issues are shared across surveys, interviews and computers [8] [7].

Surveys are closely similar to interviews in terms of the specific questions that can be addressed. Fortunately, in an ironic celebration of human-computer interfacing, computer surveys are known to be more preferred by users, faster to complete, and significantly more effective at delivering fully completed responses in general. [9] They do, however, suffer from many of the same biases.(cite?)

Although these methods have advantages in the collection of qualitative data, an analysis of human-computer-interaction may well benefit more from automated data collection software. This is leveraged by the fact that an HCI evaluation will already involve a computer, making it efficiently non-invasive.

2.4 Think Aloud Protocol

The Think Aloud Protocol is not necessarily an independent testing process. It is a protocol wherein a user, or perhaps expert, explains their thought process aloud. This provides a specific benefit of understanding a user's thought process [10]. It may allow

users to express any frustration that is otherwise not indicated. This enables a designer or assessor to understand the habits of the user and challenges they are likely to face.

It is believed that thought processes can occur much faster than speech [11], making an exhaustive evaluation of thoughts impossible through this method alone. However, the addition of a more automated method, such as eye tracking, coupled with additional recording and observations may produce a clearer picture. This suffers from the same issue of collating data,

3 Method choice comparison

4 Conclusions

4.1 Server system

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