Cognitive Graphical Walkthrough Interface Evaluation

Athanasis Karoulis
Aristotle University of Thessaloniki, Greece

Stavros Demetriadis
Aristotle University of Thessaloniki, Greece

Andreas Pombortsis
Aristotle University of Thessaloniki, Greece

INTRODUCTION

Interface evaluation of a software system is a procedure intended to identify and propose solutions for usability problems caused by the specific software design. The term evaluation generally refers to the process of "gathering data about the usability of a design or product by a specified group of users for a particular activity within a specified environment or work context" (Preece et al., 1994, p. 602). As already stated, the main goal of an interface evaluation is to discover usability problems. A usability problem may be defined as anything that interferes with a user's ability to efficiently and effectively complete tasks (Karat et al., 1992).

The most applied interface evaluation methodologies are the expert-based and the empirical (user-based) evaluations. Expert evaluation is a relatively cheap and efficient formative evaluation method applied even on system prototypes or design specifications up to the almost-ready-to-ship product. The main idea is to present the tasks supported by the interface to an interdisciplinary group of experts, who will take the part of would-be users and try to identify possible deficiencies in the interface design.

According to Reeves (1993), expert-based evaluations are perhaps the most applied evaluation strategy. They provide a crucial advantage that makes them more affordable compared to the empirical ones; in general, it is easier and cheaper to find experts rather than users who are eager to perform the evaluation. The main idea is that experts from different cognitive domains (at least one from the domain of HCI and one from the cognitive domain under evaluation) are asked to judge the interface, everyone from his or her own point of view. It is important that they all are experienced, so they can see the interface through the eyes of the user and reveal problems and deficiencies of the interface. One strong advantage of the methods is that they can be applied very early in the design cycle, even on paper mock-ups. The expert's expertise allows the expert to understand the functionality of the system under construction, even if the expert lacks the whole picture of the product. A first look at the basic characteristics would be sufficient for an expert. On the other hand, user-based evaluations can be applied only after the product has reached a certain level of completion.

BACKGROUND

This article focuses on the expert-based evaluation methodology in general and on the walkthrough methodologies in particular. The Cognitive Graphical Jogthrough method, described in detail in Demetriades et al. (1999) and Karoulis et al. (2000), belongs to the expert-based evaluation methodologies. Its origin is in Polson et al.'s (1992) work, where the initial Cognitive Walkthrough was presented (Polson et al., 1992; Wharton et al., 1994) and in the improved version of the Cognitive Jogthrough (Aedo et al., 1996; Catenazzi et al., 1997; Rowley & Rhoades, 1992). The main idea in Cognitive Walkthroughs is to present the interface-supported tasks to a group of four to six experts who will play the role of would-be users and try to identify any

possible deficiencies in the interface design. In order to assess the interface, a set of tasks has to be defined that characterizes the method as task-based. Every task consists of a number of actions that complete the task. The methods utilize an appropriately structured questionnaire to record the evaluators' ratings. They also are characterized as cognitive to denote that the focus is on the cognitive dimension of the user-interface interaction, and special care should be given to understand the tasks in terms of user-defined goals, not just as actions on the interface (click, drag, etc.).

The evaluation procedure takes place as follows:

- A presenter describes the user's goal that has to be achieved by using the task. Then the presenter presents the first action of the first task.
- The evaluators try to (1) pinpoint possible problems and deficiencies during the use of the interface and (2) estimate the percentage of users who will possibly encounter problems.
- When the first action is finished, the presenter presents the second one and so forth, until the whole task has been evaluated. Then, the presenter introduces the second task, following the same steps. This iteration continues until all the tasks are evaluated.
- The evaluators have to answer the following questions in the questionnaire:
    1. How many users will think this action is available?
    2. How many users will think this action is appropriate?
    3. How many users will know how to perform the action? (At this point, the presenter performs the action)
    4. Is the system response obvious? Yes/No
    5. How many users will think that the system reaction brings them closer to their goal?

These questions are based on the CE+ theory of exploratory learning by Polson et al. (1992) (Rieman et al., 1995). Samples of the evaluators' questionnaire with the modified phrasing of the questions derived from the studies considered here can be obtained from http://aiges.csd.auth.gra/academica.

THE COGNITIVE GRAPHICAL WALK- AND JOG-THROUGH METHODS (CGW/CGJ)

The basic idea in modifying the walk- and jog-through methods was that they both focus on novice or casual users who encounter the interface for the first time. However, this limits the range of the application of the method. Therefore, the time factor was introduced by recording the user's experience while working in the interface. This was operationalized through the embodiment of diagrams in the questionnaires to enable the evaluators to record their estimations. The processing of the diagrams produces curves, one for each evaluator; so, these diagrams graphically represent the intuition and the learning curve of the interface. The learning curve in its turn is considered to be the main means of assessing the novice-becoming-expert pace, which is the locus of this modification.

Two main types of diagrams are suggested in Figure 1.

The differentiation of the diagrams refers mainly to their usability during the sessions, as perceived by the evaluators. The main concern of the applications was to pinpoint the easiest diagram form to use.

THE FOUR APPLICATIONS

Application I: The Network Simulator

The modified method of the Graphical Jogthrough was first applied for the evaluation of an educational simulation environment, the Network Simulator. Any simulation is a software medium that utilizes the interactive capabilities of the computer and delivers a properly structured environment to the learner, where user-system interaction becomes the means for knowledge acquisition (Demetriades et al., 1999). Consequently, the main characteristics of a simulation interface that can and must be evaluated are intuitiveness (using proper and easily understandable metaphors), transparency (not interfering with the learning procedure) (Roth & Chair, 1997), as well as easy mapping with the real world (Schank & Cleary, 1996).