Automated end-user behaviour assessment tool for remote product and system testing

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Abstract

This paper introduces a virtual reality (VR) based automated end-user behavioural assessment tool required during product and system development process. In the proposed method, while VR is used as a means of interactive system prototype; data collection and analysis are handled by an event based system which is adopted from human–computer interaction and data mining literature. The overall objective of the study is developing an intelligent support system where physical prototyping and the needs for human involvement as instructors, data collectors and analysts during the user assessment studies are eliminated. The proposed method is tested on a product design example using 27 subjects. The experimental results clearly demonstrate the effectiveness of the proposed user assessment tool.
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Keywords: System design; End-user assessment; Automation; Virtual reality; Data mining

1. Introduction

Today, designers and researchers are continuously seeking the optimal product design solutions that lead to more user friendly products, which are safer to use, easier to maintain, and facilitate assembly and disassembly. Designing such products is made possible by the collaborative work of both the designers and the end-users of the products (consumers). Although designers could work on a given prototype before information is gathered from the consumer, the finer details of a prototype may only be worked out once pertinent information from the consumer is collected.

Prototypes come in both physical and virtual forms. Through usability testing, on actual prototypes supervised by experts, crucial user-data is collected for detailed analysis. In traditional test environments, users perform given tasks on the system and testers observe the user–system interaction to detect problems in the system. However in remote usability testing, subjects use virtual prototypes of evaluated systems. The results can be either interactively followed through audio/video communication channels, or they can be recorded in log files to be analyzed latter. The virtual prototypes and remote testing perform an immense service, in that they enable the products or systems to be evaluated in large geographical regions; serving both companies that have product development in various countries, as well as many different potential user groups in general.

As aforementioned, many remote testings record and transmit video/audio data to be analyzed afterwards (Hammontree, Weiller, & Nayak, 1994; Kuutti et al., 2001), this meaning that although the test is conducted in a computerized environment, the data analysis still requires an expert interpretation. The need for an expert during the data analysis is time consuming, as experiments could only be conducted on a small subject group in a limited geographical region. Additionally, observational data analysis performed without software-support only provides qualitative results recorded by human observers during the experiment (i.e. completed, failed, repeated etc.). While on the

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