Interactivity in Educational Web Applications: Evaluation Methods and Improvement Strategies

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"Interactivity", a key buzzword of the information age, has become an essential goal of many educational, entertainment and eCommerce Web development efforts. JavaScript-, Java- and Shockwave-applications promise higher involvement of the learner/user, more sophisticated user interactions (beyond the usual hypertext navigation), and Web services that can adapt to the user's skills and preferences ("user modelling"). Although these concepts have been applied in a great number of instructional CD-ROMs and computer games already, their implementation on the WWW is still rare. One of the reasons are (often substantial) system response times (SRT), or "net lags", encountered in open networks, especially for multimedia content. As our studies, among others, have shown, SRT beyond a certain duration can impact both the involvement as well as the emotional state of the user. Though such technical problems as "net lags" may (and certainly will) be remedied in the future, our research emphasizes the potential of analyzing the temporal properties of the human-computer interaction for understanding and improving this process.

Obtaining quantitative measures (as opposed to qualitative data, e.g. questionnaire ratings) on the WWW is both a challenge and an opportunity. We developed a JavaScript tool for creating a high resolution, time-stamped, event-related protocol of the user's navigation within and between electronic documents, and implemented it to record both the technology-induced times (SRT) and the human-dependent times (decision/action times). It was used in a series of lab experiments as well as in the interactive educational Web application "Interactive Shakespeare". Results emphasize the critical role of "time design" for realizing the full potential of interactive applications. Based on "Interactive Shakespeare", we demonstrate how breakdowns of the interaction-flow can be diagnosed and interpreted, and how this information can be used to enhance existing Web sites.

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