Dialog Flow Specification and Control for Web Applications

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Abstract

Despite its high popularity as a platform for enterprise information systems, the World Wide Web offers only limited intrinsic support for the design and development of complex user interfaces. The marginal architectural support and the lack of suitable modeling methods for user navigation often fosters *ad hoc* implementations of tightly intertwined presentation and business layers whose implementation and maintenance is tedious and error-prone, resulting in high development effort and suboptimal usability.

To ameliorate this situation, this thesis addresses several unique challenges that developers of web applications typically face, and proposes an integrated set of solutions that is based on a common model of a web application's dialog structure:

The thesis first describes the syntax and semantics of a formal model for user navigation in web applications that includes all interaction between components of the presentation and business layers, collectively termed an application's **dialog flow**. It introduces a visual language for dialog flow modeling that can serve as an executable specification for a framework that drives web applications' user interfaces accordingly.

Since the web's infrastructure provides only rudimentary data flow conduits, which often do not exactly fit the data provision requirements of the business domain, manually implemented data propagation bears the danger of memory leaks or security risks. The thesis therefore introduces a supplemental mechanism for specifying and controlling **data flows** that are integrated with dialog flows, in order to match business process requirements more closely.

Another unique challenge in navigating web applications stems from browsers' *Back*, *Forward* and *Reload* buttons, which may drive the server into undefined states. Continuations have been proposed as a theoretical technique to deal with this problem. This thesis introduces practical strategies for the **handling of continuations** that take the structure of the dialog flow into account, in order to prevent backtracking beyond specified "points of no return".

Finally, the increasing capabilities of mobile devices allow users to access web applications from a variety of devices today. Since it is time-consuming to define all the possible dialog masks and dialog flow variants for different device classes manually, this thesis introduces an approach for the abstract, device-independent definition of dialogs at design time, and proposes techniques for their **automatic pagination** into suitable micro dialog flows at run time.

Through these contributions, the thesis aims to provide an integrated set of solutions for some of the most common challenges in web application development. This promises potential for reducing the development effort of web applications on desktop and mobile devices, by eliminating the need for manual implementation of complex aspects of user navigation, and instead providing a continuous transition from requirements-driven dialog flow specifications to actual application behavior.