Dependability in Web Software

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1 Introduction

The web is an increasingly important platform used for a wide variety of tasks on a regular basis. And as the web becomes more important, the ways in which it is used grows increasingly sophisticated. End users build web pages and applications, use web applications in new and unexpected ways and use web macro tools to automate web-based tasks. All of these tasks are error-prone. In addition, they often depend on external components outside of the control of the developer or end user. Therefore we have been developing tools and methodologies to assist users with these tasks.

One of our methodologies uses dynamic characterization of the web application interface to assist the application builder in finding anomalous behavior in their applications and to help users understand how they can access the application's features.

In other work, we have attempted to improve the maintainability and robustness of web macros. To do this we have developed a family of assertions that work with web macros to detect certain types of erroneous or changed behavior in the uses of web applications and indicate to the user when these assertions are violated so they can update the web macro accordingly.

2 Dynamic Characterization of Web Application Interfaces

Our early work in dynamic characterization of web applications was motivated by the use of existing web applications in mashups, web applications that combine data from multiple sources for some particular purpose [2]. This work included several static analysis methods to characterize certain properties of the interfaces to web applications, as well as one dynamic method for identifying mandatory and optional variables in the interface. The dynamic method operated by constructing and submitting multiple requests with different combinations of variables present in these requests, and characterized the result as either successful or unsuccessful. It was then able to use this collected information to identify which variables were required in a successful request.

Further work extended this basic method to detect a wider array of properties in the interfaces to a class of web applications we call specialized search engines [1, 3]. The new properties include dependencies between variables, ranges of allowable values for variables, and relationships between results for different values. We have applied our methodology to a variety of search applications and found anomalous behavior in the majority of these applications.

3 Assertions in Web Macros

Robofox is a Firefox plug-in that allows users to program web macros by demonstration [4]. Since web sites evolve over time (e.g., style, layout, flow) and these changes can cause faulty behavior in executing macros or prevent the macros from executing at all, we have developed a family of assertions within Robofox to detect and report anomalous run-time behavior to users.

As the user records a web macro, assertions are automatically created for each operation performed. These assertions can then be viewed and edited by the user. When the macro is run, these assertions are checked, and if any are violated, violations are reported to the user so that appropriate changes to the web macro can be made.

4 Future Work

We are continuing to work on both the dynamic characterization and web macro assertion methodologies. For dynamic characterization, we are extending our methodology to cover other classes of web applications beyond search. More specifically, we are currently looking at shopping carts and product configuration applications. Within the web macro dependability area, we will be evaluating the usability and effectiveness of the approach, and we are considering and investigating other dependability devices to assist in controlling the impact of a faulty macro.

References

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