A Trusted Infrastructure for Symbolic Analysis of Event-Driven Web Applications (Artifact)

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Abstract  
This artifact contains the implementation of JaVerT.Click, a symbolic analysis tool for modern event-driven Web applications. The tool extends JaVerT 2.0, a state-of-the-art symbolic execution tool for JavaScript (JS), with JS reference implementations of the DOM Core Level 1, DOM UI Events, JavaScript Promises and the JavaScript async/await APIs, all underpinned by a simple Core Event Semantics which is sufficiently expressive to describe the event models underlying these APIs. Our reference implementations mostly follow the respective standards line-by-line and are all thoroughly tested against the official test suite. We also evaluate JaVerT.Click by performing symbolic analysis on two real-world libraries: cash and p-map, finding three previously unknown bugs.

1 Scope
This artifact contains a trusted infrastructure for the symbolic analysis of modern event-driven Web applications which, we believe for the first time, supports reasoning about code that uses multiple event-related APIs within a single, unified formalism. Using this infrastructure, we...
develop JaVerT.Click as an extension of JaVerT 2.0 [1], a state-of-the-art symbolic analysis tool for JavaScript. JaVerT.Click comprises: (1) a Core Event Semantics, which captures the fundamental building blocks underpinning the event models of widely-used APIs; and (2) trusted JS reference implementations of DOM Core Level 1, DOM UI Events, JS promises, and the JS async/await, the APIs targeted in the related paper. We provide the test suites of the four JS reference implementations. We also provide the concrete and symbolic test suites of the cash library [3], a widely-used alternative for jQuery, which makes heavy use of DOM UI Events. Although we have recently performed symbolic analysis on the p−map library [2], for space restrictions, we delay the full account of our analysis to a future publication and do not include our analysis of p−map in this artifact.

This artifact supports the following claims of the paper: (1) our JavaScript reference implementations of the DOM Core Level 1, DOM UI Events and JS Promises APIs follow the respective standards line-by-line; (2) all four reference implementations were thoroughly tested and pass all applicable tests as described in the evaluation section of the paper; (3) JaVerT.Click is able to perform symbolic analysis of the cash library. We create a symbolic test suite for the events module with 100% line coverage, establishing bounded correctness properties and findings two previously unknown bugs.

2 Content
The artifact includes:
- a README file describing the project structure, with instructions for running JaVerT.Click and reproducing the experiment results;
- the source code of JaVerT.Click implemented in OCaml;
- a VM image (javert-click.ova) that replicates the execution environment for JaVerT.Click.

3 Getting the artifact
The artifact endorsed by the Artifact Evaluation Committee is available free of charge on the Dagstuhl Research Online Publication Server (DROPS). In addition, the artifact is also available at: https://github.com/javert-click/javert-click.

4 Tested platforms
JaVerT.Click was developed and tested in OSX 10.14 and 10.15. The artifact is packaged as a VM with Ubuntu 18.4 LTS installed. The recommended VM settings include 8GB RAM and 4 allocated CPUs.

5 License
The artifact is available under the BSD 3-Clause License.

6 MD5 sum of the artifact
The md5 sum of the artifact is c835f96d72b5cfaee386637e517db944.

7 Size of the artifact
The size of the artifact is 4.92 GiB.
References

