Sticklet: An End-User Client-Side Augmentation-Based Mashup Tool

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Abstract. A critical aspect of mashup tools for end users is to come up with an intuitive metaphor. *Sticklet* is an augmentation-based mashup tool that conceives websites as *walls* where you can fix *HTML* fragments (*sticky notes*) from other websites. *Notes* are contextualized to the hosting website, i.e. location, parameter passing and layout should be harmonized to those of the website. A set of declarative constructs are available to declaratively specify complex *sticky notes*. *Sticklet* is realized as an internal DSL in *JavaScript* that capitalizes on browser weavers (e.g. *Greasemonkey* (*GM*)). Being full-fledged *GM* scripts, *Sticklet* benefits from the sharing repositories (e.g. www.userscripts.org) or management utilities (e.g. activation, installation, edition) available for *GM*.

1 Motivation

We address a special kind of mashuping known as Web augmentation [2]. Web Augmentation is to the Web what Augmented Reality is to the physical world: layering relevant content/layout/navigation over the existing Web to customize the user experience. For instance, when rendering a book at *Amazon*, it could be useful to know the prices/comments for this book at other online bookshops, or to directly check if this book is available at your library, all without leaving *Amazon*. Traditionally, this is achieved through *JavaScript* (*JS*) using browser weavers (e.g. *Greasemonkey*). To date, over 43 million of downloads of *Greasemonkey* scripts ground the vitality of this movement. However, these efforts are hindered by being programming intensive and prone to malware. We strive to open Web Augmentation to users other than *JS* programmers. To this end, we developed *Sticklet*, an internal DSL in *JavaScript* which targets *JS*-ignorant users. Users are expected to be computer-literate (e.g. able to write an *Excel* formula).

2 Sticklet

The lifecycle of a *Sticklet* expression (hereafter referred to as a “sticklet”) includes three main stages: definition, deployment and enactment.

Definition. *Sticklet* conceives the Web as a *wall* to be decorated with *stickers* (i.e. *HTML* fragments *dynamically* obtained from other websites). The pair (*wall*,

Fig. 1. Sticklet lifecycle: definition, deployment and enactment

sticker) conforms an augmentation unit, i.e. a *sticklet*. Consider fixing *stickers* in Amazon with the prices of the current book at other online bookshops. This is a popular JS script known as *BookBurro* which accounts for over 900 lines of JS code¹. The *sticklet* counterpart is shown in Figure 1. The constructs of the DSL include: *walls*, *bricks*, *notes* and *levers*. **Walls** (line 9) can be regarded as “views” upon existing websites. A *wall* comprises those websites whose URLs match a given regular expression (*WhenOnWall* clause). The scope of the *sticklet* is defined by its *wall* as well as the existence of some *bricks*. For our sample problem, the *wall* expands along those Amazon pages that hold an *ISBN brick*. **Bricks** (lines 10 & 14). They are named nodes upon HTML documents which are worth singularizing for either data extraction, scoping or layering purposes. A *brick* holds (1) an XPath to pinpoint the node (*SelectBrick* clause), (2) a

¹ *BookBurro* is available at <http://userscripts.org/scripts/source/1859.user.js>

regular expression to extract the node's content (*ExtractContent* clause), and (3), the *brick's* name (*As* clause). **Notes** (line 15) are expressions that combine text and *bricks* (*StickNote* clause). *Bricks* can be obtained from the *wall* as well as from URL-addressable services (*LoadNote* clause, line 13). For the sample problem, a request is made to *BookByte* where URL parameters are obtained from previously extracted *bricks* (e.g. *\$isbn*). The outcome is used to pinpoint a new *brick*: *\$price*. Finally, *bricks* from different sources are used to conform to the *note* (*StickNote* clause). *Notes* might be readily stuck as soon as the user enters the *wall* or displayed on demand by acting on a *lever*. **Levers** (line 11) permit to obtain *notes* on demand. *Levers* are named after the *sticklet* (e.g. “*Price At BookByte for \$isbn*”) where the *brick* content is resolved at runtime. *Levers* are positioned according to *bricks*. For our sample problem, a *lever* (realized as a *link*) is inlayed *after* the brick *\$isbn*. On acting upon the *lever* (in this example through a “click”), a URL-addressable service is enacted. For our sample case, on clicking, the *BookByte* request is conducted; next, the book price is obtained and finally, the *note* is rendered.

Deployment. Being Sticklet an internal DSL, *sticklets* do behave as traditional *Greasemonkey* (*GM*) scripts, e.g. the file extension is .user.js. Hence, *sticklets'* deployment is achieved in the very same way as *GM* scripts: drag&drop on *Firefox*. However, unlike *GM* scripts, *sticklets* postpone the definition of some of its clauses till deployment time. Specifically, “assisted-valued” clauses are resolved at deployment time through the help of the *Sticklet* engine. Specifically, *XPath* and regular expressions are heuristically obtained by interacting with the user. *Sticklet* intersperses a grid-like structure on top of the current *DOM* tree. As the user moves the cursor around the screen, the *DOM* node under the current cursor location is highlighted. By clicking, the user feeds the *XPath* inferring algorithm with the selected node as an example, while *Sticklet* highlights all the nodes that fulfilled the extraction pattern generated so far. This process is iterated till the desired nodes are selected. The process ends by re-generating the *sticklet* but now fully resolved and ready for enactment.

Enactment. *Sticklets* are automatically executed by *GM* when on the *wall*. Pages are augmented with the *sticklet* supplement as soon as they are loaded and lever triggered. Besides *GM* itself, this requires the previous installation of the *Sticklet* engine². Over 20 *sticklets* are available at <http://userscripts.org/users/Sticklet>.

3 Related Work

Platypus is a Visual Programming Tool [4]. It obtains full-fledged *JavaScript* code for *Greasemonkey* using a graphical toolbar. Users directly act upon the current page through the *Platypus* toolbar to obtain the *GM* script. *Platypus* is a neat tool for its purpose: changing a web page based on the page itself. On the downside, visual tools might restrict the expressiveness to facilitate

² <https://addons.mozilla.org/addon/Sticklet/>

code generation (e.g. in *Platypus*, no page other than the current page can be accessed).

Chickenfoot illustrates the API approach [1]. An API introduces some abstractions that shelters users from how these abstractions are implemented *but without leaving the hosting language*. *Chickenfoot* is more expressive than *Sticklet*. *Sticklet* just focuses on a special kind of customization: augmentation. But this limited focus permits to come up with a self-contained, domain-oriented vocabulary, and to stick to this vocabulary. Unlike *APIs*, DSLs have to do without resorting to the underlying language. *Sticklets* can only contain *Sticklet* terms. No general *JS* sentences are permitted. Although this limits expressivity, it brings understandability and trustworthiness (“malware free by construction”).

MashMaker illustrates a hybrid approach [3]. A distinctive aspect is that programmers and end-user asynchronously collaborate to come up with the augmentation. A *MashMaker* project encompasses three artefacts: the data extractor (graphically defined), the augmentation widget (which is separately coded in *JavaScript*), and the so-called “mashup” (graphically defined). The “mashup” links the two previous artefacts so that the widget is fed from the extractor. A library of widgets is made available by programmers to end users. This introduces two actors during augmentation: widget programmers and end-user “linkers”. By contrast, *Sticklet* relies on a single user.

4 Conclusions

We introduce *Sticklet*, a textual DSL for Web Augmentation. *Sticklet* is based on *JS* but limits *JS* generality for the sake of learnability and understandability. First evidences indicate that users with no *JS* background can easily build their own *sticklets*, and, not less important, understand someone else’s *sticklets*, hence promoting sharing and collaboration.

References

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