DESK-H: building meaningful histories in an editor of dynamic web pages

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Extended abstract

DESK is a WYSIWYG editor for dynamic web pages that are generated from an explicit ontology-based domain model [3]. DESK provides a significant scope of customization functionalities for dynamic pages with maximum ease of use, relieving users from having to edit the internal page generation code. In this paper we describe DESK-H, the monitoring module of DESK, that tracks all user actions in the DESK HTML editor and outputs a high-level semantic history of editing actions. The purpose of DESK-H goes beyond its current use in DESK: it provides an enriched model of user actions that can be exploited by other tools to carry through a Programming By Example (PBE) [1] approach.

DESK-H works under the following assumptions:

- The web pages DESK-H operates on are dynamically generated by a complementary generation module as the user navigates over an information space.
- The information space is modeled as a semantic network (a graph) of domain objects with attributes and relations according to an explicit ontology.
- Hyperspace navigation is understood as a traversal of the semantic network, so that each time a node is attained, a web page is generated for that node, selecting pieces of the node contents, and possibly of surrounding nodes, to make up the page.

In our current implementation, the ontology-based data model must be provided in RDF, a widely accepted standard for ontology definition [2], but it would be straightforward to support other ontology definition languages as well [4]. An implementation of a page generation system, namely PEGASUS that fulfills our assumptions is described in [4].

DESK-H lets the user edit a specific page that has been generated under these assumptions. DESK-H records all user actions in the WYSIWYG editing environment, and tries to find more meaning for the actions, in terms of both HTML display structures (paragraphs, lists, tables, widgets), and parts of the domain model (objects, relations, attributes). This enriched model is used by an inference module of DESK that is able to modify the page generation procedures in the underlying system (PEGASUS) to accommodate the changes made by the user to a specific page. In this paper we focus on the monitoring side of DESK, whose structured output can be useful beyond the scope of DESK/PEGASUS.

In the most basic sense, DESK-H consists of two specialized tools, one located at client front-end (HTML editor) and another one located at server back-end. Both tools involve different subsets of heuristic modules for obtaining:

1. Syntactic information coming from user's actions. From each user's action occurred at front-end, DESK-H detects syntactic (HTML) blocks involved in such action. A block can be considered as a syntactic HTML fragment, in witch the context location being inferred by DESK (i.e. start and end positions as well as location before and/or after the context). User's actions are encapsulated into suitable constructor primitives for building up a *monitoring model*, that is a structured model containing filtered user's actions as well as context information about such actions. Those heuristics also detect and manage widgets either being created by the user or just being created in previous sessions. Therefore DESK-H deploys a homogeneous processing that can be though of as the selection of meaningful fragments to be later identified under a semantic context.

2. Semantic information coming from syntactic primitives in the monitoring model. Once the monitoring model has been sent to DESK back-end, a set of heuristics attempts to enrich the monitoring model with semantic information extracted from domain model. The chief objective of such heuristics is to finally build on the historic information about changes related to user's actions. For each user's change, DESK-H finds out a main object, a relation path witch the modified object comes from, as well as internal information about the affected object such as involved attributes and the class of such object. This process is achieved by applying several search and object-identification heuristics that search the ontology-based domain model for semantic knowledge and suitable relationships between related domain objects.

DESK-H's internal heuristics are also intended to address inherent process difficulties such as ambiguities as a result of finding several semantics for a same syntactic context. To face those ambiguities, DESK-H arranges a subset of selection criteria to carry out the disambiguation process. Therefore DESK-H discards values not related to main object and chooses closest values to main object first, giving priority to values that have been involved in previous actions. User's interaction is required as long as there might not be any chance for automated disambiguation, prior user answers to the same questions being also taken into account for resolving similar future ambiguous situations.

As a result of the process, DESK-H finally provides with a historic model in order for any change accomplished by user to be codified using minimum amount of suitable semantics. Those semantics comprise a path access to domain and ontology information, the generated historic information is codified using XML language, thus changes can be processed by any web presentation system regardless of the presentation language or the templates used by such a system.

References

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