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Software Engineering Project XPerf

Maintenance Manual

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Contents

1. Introduction

The implemented subsystem is an extension to MAISA [1]. MAISA is a program that can be used to measure different quality factors in the design phase of the software engineering process. MAISA reads UML-diagrams [2] from files and generates metrics from them.

The goal of the XPerf-project was to add support for documents in the XML Modelling Interface (XMI) -format [3]. The range of data read from an XMI-document is bound by the limits of MAISA. A detailed list of the read data is contained in the Specification Document of the XPerf project [6].

Adding support for new types of documents is eased due to the introduction of a plugin-framework for document handlers.

1.1. Prior changes to the MAISA-system

The MAISA-system has been extended by two prior Software Engineering Project – groups, Perf [4] and Perf+ [5] and as part of the thesis of a former student.

2. Current state of MAISA

This chapter focuses on the design issues of the document reading facility, not on the state of the MAISA-system as a whole.

2.1. Currently implemented features

Dynamic selection of an appropriate reader module

The document reading facility of the MAISA-system takes a dynamic approach to resolving an appropriate reader module for a given file. The MAISA-system is configured with the names of classes implementing the MAISA.reader.DocumentReader-interface. During the initialization process of the system an instance of each class is created an put into a list. For each file that has been selected for import the list is traversed, until (a), a reader is found that can interpret the contents of the given file or (b), the elements in the list have been exhausted. In the case of (a), control is passed to the reader module and in the case of (b) the file is rejected.

XMI-module

The XMI-reader module supports the documents conforming toversion 1.0 of the XMI-specification, supporting version 1.3 of the UML-specification. The XMI- reader module is implemented in the MAISA.reader.xmi.XMIDocumentReader-class.

Prolog-module

The Prolog-reader module supports documents in a propriatary Prolog-like format, which is covered in the Specification Document of the XPerf-project [6]. The Prolog-reader module is implemented in the MAISA.reader.PrologDocumentReader class.

2.2. Limitations

Since MAISA supports only a subset of UML, the currently implemented reader modules focus only on the elements that are actually supported. The supported elements and their attributes are covered in the Specification Document of the XPerf-project [6].

2.3. Concurrency in XMI-reader module

The current implementation of the XMI-reader module is not threadsafe.

2.4. Architecture

The architecture of the document reading facility is described in full in the Design Document of the XPerf-project [7].

3. Further extending the MAISA-system

The following is a list of features that would further extend the MAISA-system.

3.1. Adding support for a new document type

Adding support for a new document type is a fairly simple process from the point of view of the MAISA-system. The only requirement for a prospect reader-module is for it to implement the MAISA.reader.DocumentReader interface.

A new reader module is made available to the MAISA-system by defining it in the reader configuration file. The format of the configuration file and its location is described in the User Manual of the XPerf project. [8].

3.2. Adding support for a new diagram type

Adding reading support for a new diagram type, for example case diagram, can be done separately in every reader-module. If the datastructures of the diagram can be simply added to MAISA without changing any existing datastructures, existing read operations of diagrams should not need any modifications.

In prolog-reader module (class *PrologDocumentReader*) support for reading a new diagram can be added simply by adding *readFooDiagram*-method and editing *read*-method to call that method.

In XMI-reader module (class *XMIDocumentReader*) support for reading a new diagram is a bit more complicated. First an implementation of *XMIDiagramReader* class must be created to read the actual diagram. Secondly class *XMIDiagramReaderFactory* must be modified to support diagram reader created. Then it depends on where the added diagram is located in the hierarcy of the XMI-document. If the root element of the diagram is child of the ModelElement, the root element of the diagram must be added into the model tree (which is a hierarcy done by *ModelNode* objects) into *read*-method in *XMIDocumentReader* class. If the root element of the diagram is inside another diagram, class diagram for example, the call of the *read*-method of diagram reader created must be inserted into it. If the diagram can be in several locations in XMI-document, inserting must be done into all these locations.

3.3. Improving file association

The current logic of associating calculation artifacts created with the MAISA-system with the diagram files they were created from is very error prone and actually depends on the manner the files where loaded (either as an independent diagram file or as part of a project directory). The concept of 'Project' could be extended to cover more than just being the peer of a physical directory in a filesystem.

3.4. Adding support for version 1.2 of the XMI-specification

The XMI-reader module could be extended to cover version 1.2 of the XMI specification. Implementing the new reader module would involve extending the existing XMI-reader module.

3.5. Abstracting the metrics calculation process

The current metrics calculation logic is very tightly coupled with the actual datastructures. The metrics calculation algorithms could be isolated and an abstraction layer could be introduced to allow several alternative algorithms to be supported.

4. Conclusions

With the separation of the document reading mechanism from the datastructures the mechanism manipulates, the introduction of a general file reading framework and the support for documents conforming to version 1.0 of the XMI-standard, the usability of the MAISA-system has been greatly extended. Adding support for new document types, e.g. documents conforming to later versions of the XMI-standard, doesn't involve modifications to the existing codebase of the MAISA-system.

5. References

[1] MAISA, Metrics for Analysis and Improvement of Software Architectures http://www.cs.helsinki.fi/group/maisa/

[2] Unified Modelling Language (UML) version 1.3 specification Copyright (C) 1997-2003 Object Management Group, Inc., [http://www.omg.org/cgi-bin/doc?formal/00-03-01].

[3] XML Metadata Interchange (XMI) version 1.0, Copyright © 1997-2003 Object Management Group, Inc., [http://www.omg.org/cgi-bin/doc?formal/00-06-01]

[4] The Perf project, http://www.cs.helsinki.fi/group/maisa/perf/

[5] The Perf+ project, http://www.cs.helsinki.fi/group/maisa/perf+/

[6] The XPerf project, Specification Document, http://www.cs.helsinki.fi/group/maisa/xperf/doc/Maarittelydokumentti_1.1.6.PDF

[7] The Xperf project, Design Document, http://www.cs.helsinki.fi/group/maisa/xperf/doc/Suunnitteludokumentti_1.0.4.PDF

[8] The Xperf project, User Manual, http://www.cs.helsinki.fi/group/maisa/xperf/doc/Usermanual.PDF