

SQUAD: Software Quality Understanding through the Analysis of Design

Foutse Khomh and Yann-Gaël Guéhéneuc

Motivation

Understanding the impact of the design on the quality of systems

Problem

Building quality models that takes into account explicitly the design of systems

Solution

Study the relations between design patterns, design defects, code smells and changes, issues and Bugs

	cc	cc2	cc3	cc4	cc5	cc6	cc7	cc8	cc9	cc10	cc11	cc12	cc13	cc14	cc15	cc16	cc17	cc18	cc19	cc20
Architecture	0.01	0.00	< 0.01	< 0.01	0.02	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
ClassDef	< 0.01	< 0.01	0.00	< 0.01	< 0.01	< 0.01	0.00	< 0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
ClassDefDiffPctns	0.00	< 0.01	0.00	< 0.01	< 0.01	< 0.01	0.00	< 0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
ComplexClass	0.00	< 0.01	< 0.01	< 0.01	< 0.01	0.00	< 0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
LongName	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LongMethod	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
LongParameterList	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
SingletonCode	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NonSerializable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
StaticFinalDate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

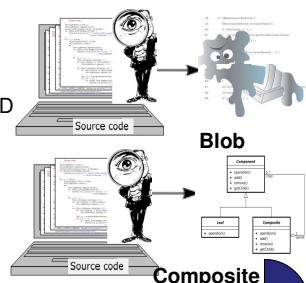
Logistic regression results for the correlations between change-proneness and kinds of antipatterns

	cc	cc2	cc3	cc4	cc5	cc6	cc7	cc8	cc9	cc10	cc11	cc12	cc13	cc14	cc15	cc16	cc17	cc18	cc19	cc20
Architecture	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
ClassDef	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ClassDefDiffPctns	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
ComplexClass	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
LongName	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LongMethod	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
LongParameterList	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
SingletonCode	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NonSerializable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
StaticFinalDate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Logistic regression results for the correlations between issue-proneness and kinds of antipatterns

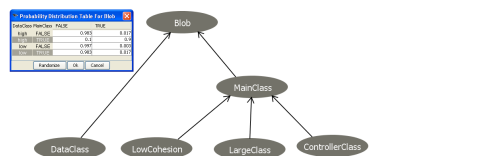
Data extraction with the frameworks SAD and PTIDEJ

- Computing design defects and code smells on systems with SAD
- Computing design patterns on Systems with PTIDEJ

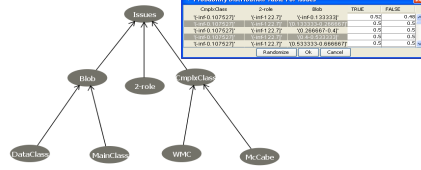


Building models for the prediction of quality, change, issues, and bug proneness

- Building models to predict design defects on the basis of metrics

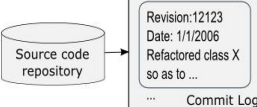


- Building models to predict changes, issues and bug-proneness using Information on metrics, design patterns, design defects and code smells

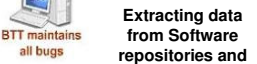


Data extraction with the framework IBOOS

- Extracting change data of systems from CVS and SVN.
- Extracting issues and bugs data of systems from Bugzilla and others



Date	Revision	LOC	Classes	Changes	Issues	Bugs
2001-11-09	1.0	741,480	4,824	21,555	2,208	169
2002-09-29	2.0	1,243,040	8,712	36,795	3,107	214
2003-04-27	2.1	1,757,217	8,730	10,397	2,111	105
2003-11-03	2.1.2	1,769,707	8,732	11,524	1,953	133
2004-01-10	2.1.3	1,769,707	8,736	15,560	3,137	309
2004-04-29	2.0	2,260,755	11,566	11,987	780	117
2004-05-10	3.0.1	2,268,705	11,197	24,150	4,295	218
2004-05-11	3.0.2	2,273,853	11,253	49,150	10,600	1,013
2004-06-29	3.2	3,271,510	15,133	2,745	650	111
2004-08-20	3.3.1	3,282,819	15,156	11,554	1,096	285
2004-09-12	3.3.2	3,286,300	15,184	10,682	2,137	103
2007-06-28	3.4	3,752,314	17,663	7,985	1,282	214
2007-06-21	3.3.1	3,746,184	17,167	40,314	14,015	792
Total	13	32,179,393	133,033	243,960	51,271	4,013



Extracting data from Software repositories and BTS

OCEAN: Software Change and Evolution Analysis

Salima Hassaine, Yann-Gaël Guéhéneuc and Sylvie Hamel

Motivation

Software repositories such as versioning systems are used to help manage the progress of software projects. Analyzing these repositories can help to support predictions about software development, and to plan various evolutionary aspects of software projects.

Problem

The complexity and the amount of data requires the use of efficient techniques for version comparisons.

Solution

We propose a metaphor of homology to study the evolution of a program.

