

Toward Instant Gradeification

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Motivation

- ★ providing useful feedback on Java programming assignments is hard
- ★ the more time we spend evaluating/critiquing style, language usage, design consistency, and logical correctness, the less we can spend on higher-level design and algorithmic issues

Static Checking

- ★ many assignment components can be statically checked with existing tools
- ★ CheckStyle/FindBugs/PMD/Metrics for style, language usage, “bug patterns”, complexity, ...
- ★ BONc for consistency between high level design and implementation
- ★ ESC/Java2 for logical correctness of formally specified code

AutoGradeMe

- ★ Eclipse plug-in integrated into development environment provided to students, tunable by instructors
- ★ uses output of existing static checkers to compute grades for parts of assignments that can be checked automatically
- ★ provides students *continuous feedback* on the quality of their code (with respect to all the issues previously mentioned)

AutoGradeMe

- ★ *typical usage: $x\%$ of this assignment's grade is taken directly from your AutoGradeMe score*
- ★ this can include automatic evaluation of design consistency and correctness with respect to formal specification – potentially a large fraction of the assignment
- ★ students know exactly what they will get for that fraction of the assignment when they turn it in – **no surprises**

Student View

Metrics	Checkstyle	FindBugs	PMD	Total
TLOC:	Errors per KLOC:	Errors per KLOC:	Errors per KLOC:	
934	0 (Total: 0.0)	0 (Total: 0.0)	0 (Total: 0.0)	
Grade: N/A	Grade: A	Grade: A	Grade: A	
Average method LOC:	Warnings per KLOC:	Warnings per KLOC:	Warnings per KLOC:	
4.51	471.09 (Total: 440.0)	1.07 (Total: 1.0)	129.55 (Total: 121.0)	
Grade: A	Grade: D	Grade: A	Grade: D	
Average method CC:				
1.44				
Grade: A				
Total:	Total:	Total:	Total:	Overall:
Grade: A	Grade: C+	Grade: A	Grade: C+	Grade: B

Student View

Metrics	Checkstyle	FindBugs	PMD	Total
TLOC:	Errors per KLOC:	Errors per KLOC:	Errors per KLOC:	
734	0 (Total: 0.0)	0 (Total: 0.0)	0 (Total: 0.0)	
Grade: N/A	Grade: A	Grade: A	Grade: A	
Average method LOC:	Warnings per KLOC:	Warnings per KLOC:	Warnings per KLOC:	
4.94	4.09 (Total: 3.0)	0 (Total: 0.0)	0 (Total: 0.0)	
Grade: A	Grade: A	Grade: A	Grade: A	
Average method CC:				
1.14				
Grade: A				
Total:	Total:	Total:	Total:	Overall:
Grade: A	Grade: A	Grade: A	Grade: A	Grade: A

Configuration View

Grade boundaries Graders

Metrics ^

Enabled? Display name Grader weight

Average method LOC enabled? weight lookup

Average method CC enabled? weight lookup

BONc ^

Enabled? Display name Grader weight

Marker ids

Scale by kloc?

Errors enabled? Errors weight Errors lookup

Warnings enabled? Warnings weight Warnings lookup

Checkstyle ^

Enabled? Display name Grader weight

Marker ids

Scale by kloc?

Errors enabled? Errors weight Errors lookup

Warnings enabled? Warnings weight Warnings lookup

ESC/Java2 v

FindBugs v

PMD v

The Present

- ★ incorporates output from all the plugins previously mentioned
- ★ available publicly, including source and an Eclipse update site, for about 2 years:
<http://www.kindsoftware.com/products/opensource/AutoGrader/>
- ★ used in several courses at UW Tacoma and ITU Copenhagen

The Future

- ★ extensibility – instructors can add any plugins they want to the mix
- ★ integration of automated unit testing (JUnit, TestNG)
- ★ evaluation of unit test coverage/results for student-written tests
- ★ evaluation of results for instructor-provided tests and (when available) automatically-generated tests

More Information

★ <http://www.kindsoftware.com/products/opensource/AutoGrader/>

★ CheckStyle, FindBugs, PMD Metrics –
Thank You!
<http://www.sourceforge.net/>

★ ESC/Java2 and BONc –
<http://www.kindsoftware.com/>

★ questions?