CS846 Paper Review Form - Winter 2012

Reviewer: Jia Liang

Paper Title: Alloy: A Lightweight Object Modelling Notation

Author(s): Daniel Jackson

1) Is the paper technically correct?
 [*] Yes
 [ ] Mostly (minor flaws, but mostly solid)
 [ ] No

2) Originality
 [ ] Very good (very novel, trailblazing work)
 [ ] Good
 [*] Marginal (very incremental)
 [ ] Poor (little or nothing that is new)

3) Technical Depth
 [ ] Very good (comparable to best conference papers)
 [*] Good (comparable to typical conference papers)
 [ ] Marginal depth
 [ ] Little or no depth

4) Impact/Significance
 [ ] Very significant
 [ ] Significant
 [*] Marginal significance.
 [ ] Little or no significance.

5) Presentation
 [ ] Very well written
 [ ] Generally well written
 [*] Readable
 [ ] Needs considerable work
 [ ] Unacceptably bad

6) Overall Rating
 [ ] Strong accept (award quality)
 [*] Accept (high quality - would argue for acceptance)
 [ ] Weak Accept (borderline, but lean towards acceptance)
 [ ] Weak Reject (not sure why this paper was published)

7) Summary of the paper's main contribution and rationale for your

recommendation. (1-2 paragraphs)

The paper discusses Alloy, a modelling language inspired by Z. Alloy is an incremental improvement over Z and OCL with a cleaner syntax, a formally defined kernel, scalars as sets, and friendlier semantics for automatic analysis. The author kept the kernel small by introducing only basic and orthogonal concepts to the kernel language. A concise kernel simplifies the implementation and encourages a cleaner language overall. Alloy's syntax design incorporates some informal notations for readability. Scalars as sets eliminates the set-scalar dichotomy, and uniforms the syntax. Alloy's syntax is more coherent than Z's syntax, consistent with the goal of increasing readability among non-mathematicians. However, the syntax is still too technical for general public consumption in my opinion. The Clafer modelling language, which uses Alloy for its backend, attempts to fill the gap.

Automatic analysis of models is the most compelling aspect of Alloy, the feature that propells Alloy above Z and OCL. The acceptance of modelling hinges on the practicality of models, whether they can produce tangible results. Bugs are expensive in software development, so the promise of a tool for automatic validity checking is alluring. Model checking is undecidable and Alloy accepts this predicament by setting bounds on the scope to reduce the infinite search space into a finite one. Unfortunately, performance is an issue. Scopes and models need to be small for the analysis to be tractable. A small scope is not an issue if a solution exists within that scope, hence Alloy can apply the small scope hypothesis, the argument that "a high proportion of bugs can be found by testing the program for all test inputs within some small scope" (Andoni, Daniliuc, Khurshid, Marinov: Evaluating the ‚ÄúSmall Scope Hypothesis‚Äù). The small model limitation is more problematic because it restricts the size of the projects palatable for model checking. The pursuit of model analysers like Alloy is worthwhile, but the current iteration of technology is insufficient. As stated in the paper, "[...] Alloy is not novel; indeed its aim is to combine familiar and well-tested ideas from existing notations." Hence the rating of marginal significance for the small step forward that Alloy brings to modelling.

8) List 1-3 strengths of the paper. (1-2 sentences each, identified as S1, S2, S3.)

S1. The author is transparent about the shortcomings of Alloy. For example, the limitations of the Alloy analyzer and the entire section entitled "Language Design Faults."
S2. The kernel, the most important component, is thoroughly explained. The section on kernel syntax, semantics, and type system is useful.
S3. The comparisions between UML/OCL, Z, and Alloy help convey the

reasoning behind Alloy's design choices, and the benefits and drawbacks of these decisions.

9) List 1-3 weaknesses of the paper (1-2 sentences each, identified as W1, W2, W3.)

W1. The author mentions several projects applied Alloy, but never makes the connection what Alloy contributed.
W2. The paper explains how performance limits the scope and model size, but does not clarify why Alloy is a worthwhile pursuit despite the problems.