

# Referee Report

## RZ: a Tool for Bringing Constructive and Computable Mathematics Closer to Programming Practice

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The authors present the system RZ which translates from constructive definitions of mathematical structures into specifications (at present for OCaml). Realizability theory is used in the translation.

**Evaluation:** The paper is very descriptive in nature (to the point that it reads like documentation), and would not necessarily motivate publication in a journal. However, I find the proposed application (automatically deriving specifications) interesting and it as far as I can see novel. I believe that it would contribute to science if more people were aware of these techniques. The paper is well written. On balance, I would be in favor of publication.

### Comments

I find the present language descriptions hard to absorb. Part of the reason could be that a somewhat mixed level of mathematical language and ASCII characters. In particular I found it hard to separate terminals from non-terminals. Furthermore I find the abundance of “:”, “[”, and “,” with slightly different meanings difficult. Sometimes brackets would help. For example, bracketing quantification would help on the last line of page 14 to avoid backtracking when after three terms with “:” one suddenly arrives at a connective “ $\leftrightarrow$ ”.

The references to Fig. 4 and 5 often seem to be off by 1.

Predicates and subsets: predicates are introduced on page 6 and subsets on page 15. Reading about subsets we find “may look surprising at first”. The explanation that follows is that witnesses to subset membership are required. This was a point confusing me already at page 6 and should perhaps better be addressed there. Still, I cannot figure out what  $|\phi|$  is, and how to read the last line of page 15.

In the middle of page 12 the word Parameter, Definition and Axiom is sans serif whereas in the Figure they are `texttt`. Also fix “scalars, , or”.

Quotients on page 16. Line 8: The implication cannot be right because that would limit quotients to only apply to equality. The example needs some work. Be clear about what you are taking a quotient of and the per on that (Cauchy sequences where  $x \approx y$  if and only if  $x = y$  and is a Cauchy sequence, if my guess is correct.) I do not believe that rapid convergence come in to the picture here as suggested, it is just a matter of having a computable modulus, any would do. So, by replacing Cauchy sequences by pairs of Cauchy sequences and modulus we would get a stable equivalence relation, I think.

On page 17 line -14 you state that you avoid  $u \Vdash \phi$  in output but 4 lines above you have output using just that.

Page 18, line 8–9 of section 6. provably-equal?

Page 20, line 5. Constants **zero** and **one**.

Page 27, last line. Blum-Shub-Smale.

Reference 4 is in a proceedings, hasn't it been published?

Reference 5 appear in LNCS 2064.

Reference 20 has small rz.