Referee Report

Stable Results and Relative Normalization
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July, 1998

This paper presents an investigation on several different notions of reduction in *Expression Reduction Systems*, a formalism for higher-order rewriting in which term rewriting and λ-calculi can be represented.

Given a set S of *values* (such as normal forms or head-normal forms in untyped λ-calculus), the notion of S-neededness is studied. To be precise, a redex is S-needed when it is contracted during every reduction to S-normal form.

The most interesting result in the paper is the characterization of normalizing S-needed reductions by means of a stability condition for the set S (a question: is there any relationship between such condition and other notions of *stability* appearing in the literature?). Such characterization is quite elegant, and clearly presented in the first half of the paper.

The second part of the paper is concerned with minimal and optimal reductions, and the relationship between them. The presentation is much less clear here, and a considerable notational apparatus is needed to prove theorems while imposing more restrictive conditions on the considered sets of values. The limitation caused on the expressive power of the formalism by these restrictions is not clear, and should be discussed by the authors.

Evidence is given only for normal forms, head-normal forms and weak head

normal forms in the λ-calculus to satisfy the regularity condition. The whole paper exhibits a considerable effort in extending well-known results to the general case of Expression Reduction System. To this aim,

mainly in the second part, a deep analysis of reduction is needed, several different kinds of redexes are distinguished; on the other hand, classical notions such as *standardization* or *residual* are assumed as known: this surely makes the paper unattractive for a non-expert reader. The paper is correct, but the proofs use very standard techniques, they often follow the same pattern of the corresponding result that they intend to generalize.

What really puzzles me about this paper is the following: this work is obtained merging two papers of the same authors which appeared in two different conference proceedings, in 1994 and 1996. It contains substantially no "added value" with respect to the sum of the previous

papers. Same introduction, same examples, same proofs. A section only, the one about hypernormalization, has been expanded in the present version of the paper.

For this reason, and taking into account the observations above, I believe that this paper should not be accepted for publication in *Information and Computation* in the present form.