

# Corrections – Context-Aware Programming Languages

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## Larger changes

The following are the most notable changes in the revised version of the thesis:

- Previously, the key thesis has been stated in the summary of Chapter 1 and then in conclusions in Chapter 9. As discussed during viva, stating the thesis early is desirable – this is now done in the beginning of Chapter 1 (page 4) and later mentions refer to it.
- The examiner’s report notes the possible relationship between coeffect algebra and semiring. Many of the examples used in the thesis form a semiring, but this is not always the case (in particular, the implicit parameters example breaks the annihilation law of a semiring). This has been clarified in Chapter 4 (page 75) and forward references have been added in Chapter 3 (page 50) where the structure appears for the first time.
- The categorical motivation for the translational semantics of structural coeffects (Section 6.6) has been revised as per discussion during the viva. The semantics of context is now comonad over a product representing individual variables  $C^r(\tau_1 \times \dots \times \tau_n)$  rather than using a separate structure  $\hat{\times}$  for vectors; the required comonad laws (adapted for the structural definition of comonad) have been added and a mention of possible generalization of vectors using a module over coeffect algebra has been added.

## Smaller changes

The following briefly summarizes how the remaining points in the examiner’s report have been addressed:

- p3** Fixed incorrect wording (examples are not exhaustive but representative)
- p6** Fixed wording (problematic approach is translating code written for rich execution environment)
- p7** Fixed wording (the section is talking about values, not variables)
- p12** Clarification added (this is intuitive distinction; added reference to later formal treatment)
- p12** Clarification added (syntactically, there is no distinction, but there is discussion when discussing semantics; added reference to later section in the thesis where this is discussed)
- p13** – Clarification added (interactive essay lets the reader explore typing & semantics)
- p16** – Used simpler example as suggested in the examiner’s report
- p16** – Clarification added (there is a stack and the topmost value from the stack is used)
- p16** – Clarification added (languages with dynamic binding can be statically typed, but this requires more powerful type system that tracks implicit parameters, akin to the one in GHC)
- p16** – Fixed wording (changed Haskell to GHC, also on page 80)
- p32** – As suggested, added a brief summary of this point to Section 1.3 in Chapter 1
- p34** – The alternative design suggested in the report has been considered, however changing the approach used in the thesis would be a major change. Both of the alternatives have advantages and disadvantages, so the discussion about the advantages and disadvantages has been clarified.
- p36** – Corrected (the mention of mapping from names to types was removed)
- p40** – Corrected (all mentions of non-determinism have been replaced with notes about principal types)
- p40** – Clarification added (this is the case for resources, but it is not clear how this works for e.g. dataflow)
- p43** – Corrected (changed as suggested; explained that this is presented mainly to show further example)
- p50** – Corrected as discussed in the “larger changes” section
- p52** – Fixed wording (removed unjustified claims and added one reference)
- p57** – Fixed wording (the definition should be seen as a sequence, however changing the notation throughout the thesis to a more usual sequence notation would likely lead to more confusion, so the original notation has been preserved)

**p75** – Corrected as discussed in the “larger changes” section  
**p78** – Corrected (the confusing text has been deleted)  
**p79** – Improved as suggested (the suggestion makes the definition simpler)  
**p122** – Removed unjustified claim and added a note about adjunction  
**p124** – Clarified (the translation is not akin to the ‘do’ notation)  
**p125** – Fixed wording (to use “get stuck” throughout the thesis)  
**p127** – This has been renamed so that the core structure is “structural coefficient algebra”  
**p130** – Fixed wording (this was the wrong way round)  
**p141** – Corrected as discussed in the “larger changes” section  
**p157** – The suggestion was considered, but there is no reusable framework that could be referred to  
**p160** – Clarification added (explaining that in our work, changes to the core language are needed)  
**p168** – The possibility of archiving the essay will be investigated  
**p173** – The same renaming as on p125 has been done in Chapter 8  
**p184** – The chapter has been renamed to reflect the fact that it contains further contribution

## Other changes

- The typos highlighted in the annotated version of the thesis have been corrected.
- References have been corrected to include detailed data; capitalization has been corrected