Choice quantification in process algebra
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Citation for published version (APA):

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Concluding remarks

We have investigated how the choice quantifiers of μCRL fit in with process algebra in the style of Bergstra and Klop (1984). Our starting point was their theory BPA^\delta of basic process algebras with deadlock.

In Chapter 2 we have introduced the theory GBPA^\delta, extending BPA^\delta with an abstract algebraic definition of generalised summation, a partial operation from sets of processes to processes satisfying a few requirements. These requirements, formulated as axioms in the form of equations, are to ensure that generalised summation indeed generalises alternative composition, and that sequential composition distributes from the right over it. We have proved that our abstract algebraic definition of generalised summation coincides with the natural generalisation of binary alternative composition in algebras of transition trees, and we conclude from this that our axioms are rightly chosen.

In Chapter 3 we have employed the theory GBPA^\delta to formalise our intuition that choice quantification is a syntactic abbreviation mechanism, used to denote sums of large (possibly infinite) sets of processes. The precise formalisation of the correspondence between choice quantification and generalised summation turned out to be a complex task. One source of discomfort was that we had to fix a data domain D to be able to say precisely which sum is denoted by a choice quantifier. As a consequence, the whole subsequent theory about pCRL is parametrised by this data domain. However, it hardly plays a meaningful role in our general theory about pCRL.

Recall that we have advertised to separate the specification of relevant data from the specification of a process. Our results in Chapter 4 may be so interpreted that in pCRL this separation is not achieved completely. Although a first-order assertion about the data can always be expressed as an equation of pCRL expressions, it is not necessarily expressible as an equation of data expressions. One might call this an anomaly in the design of pCRL, and at least from a theoretical point of view, it is another source of discomfort. For instance, a relatively complete axiomatisation of the equational theory of pCRL can only be obtained under additional assumptions with respect to the expressiveness of the data language (cf. Chapter 5).

In Chapter 6, we have used the results of the earlier chapters to improve the presentation of the theory of choice quantification. Recall that a data algebra consists of two parts: a Boolean algebra of conditions and a data part to serve as domain for the choice quantifiers. In the theory of basic process modules, the Boolean part is still present, in the form of the imported cylindric algebra. The