

On Modular Termination Proofs of General Logic Programs

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Abstract

We propose a modular method for proving termination of general logic programs (i.e., logic programs with negation). It is based on the notion of acceptable programs, but it allows us to prove termination in a truly modular way. We consider programs consisting of a hierarchy of modules and supply a general result for proving termination by dealing with each module separately. For programs which are in a certain sense well-behaved, namely well-moded or well-typed programs, we derive both a simple verification technique and an iterative proof method. Some examples show how our system allows for greatly simplified proofs.

1 Introduction

It is standard practice to tackle a large proof by decomposing it into more manageable pieces (lemmata or modules) and proving them separately. By composing appropriately these simpler results, one can then obtain the final proof. This methodology has been recognized an important one also when proving termination of logic programs. Moreover most practical logic programs are engineered by assembling different modules and libraries, some of which might be pre-compiled or written in a different programming language. In such a situation, a compositional methodology for proving termination is of crucial importance.

The first approach to modular termination proofs of logic programs has been proposed by Apt and Pedreschi in (Apt and Pedreschi 1994). It extends the seminal work on acceptable programs (Apt and Pedreschi 1993) which provides an algebraic characterization of programs terminating under Prolog left-to-right selection rule. The class of acceptable programs contains programs which terminate on ground queries. To prove acceptability one needs to determine a measure on literals (*level mapping*) such that, in any clause, the measure of the head is greater than the measure of each body literal. This implies the decreasing of the measure of the

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