Chapter II

Verifying Web Site Properties Using Computational Logic

João Cavalcanti
The University of Edinburgh, Scotland

David Robertson
The University of Edinburgh, Scotland

ABSTRACT

The continuing increase in size and complexity of Web sites has turned their design and construction into a challenging problem. Systematic approaches can bring many benefits to Web site construction, making development more methodical and maintenance less time consuming. Computational logic can be successfully used to tackle this problem, as it supports declarative specifications and reasoning about specifications in a more natural way. Computational logic also offers metaprogramming capabilities that can be used to develop methods for automated Web site synthesis. This chapter presents an approach to Web site synthesis based on computational logic and discusses in more detail two important features of the proposed approach: the support for property checking and integrity constraint specification and verification.
INTRODUCTION

Web site design and maintenance has become a challenging problem due to the increase in volume and complexity of information presented. It often involves access to databases, complex cross referencing between information within the site and sophisticated user interaction.

A design principle accepted by many authors is separation between information content, navigation structure and visualisation (Florescu, Levy, & Mendelzon, 1998; Schwabe & Rossi, 1995). This idea promotes a better understanding of the data requirements (content), the underlying architecture of the site (navigation) and an appropriate user interface (visualisation). Furthermore it makes maintenance tasks easier, as each of those components can be managed separately.

Another design principle is to define a Web site application in a declarative way. This allows a great deal of flexibility, particularly in choosing different visualisations for the same specification. It also supports automated reasoning, allowing constraint and property verification against a specification, and in some cases, for entire Web sites to be generated from specifications. The degree of automation may vary, from a few page templates being generated to the generation of a complete Web site application.

One motivation for this work is the fact that computational logic has not been well exploited to address the problem of Web site specification and generation. Logics provide a high-level and abstract approach, whereby unimportant implementational details can be conveniently postponed until later stages of development. Mappings between some logics and more “concrete” formalisms have been proposed (Proietti & Pettorossi, 1994). Some logic specifications (although understood in an abstract sense) can also be executed in a procedural style in order to reason mechanically about their consequences (Fuchs, 1992).

As logic programming is intrinsically declarative, it supports application specification and integrity constraint specification and verification in a more natural way. Symbolic manipulation and metaprogramming facilities also make the use of computational logic techniques appropriate for automated Web site synthesis (Robertson & Augustí, 1999).

We have developed an approach to Web site synthesis based on the ideas above (Cavalcanti & Robertson, 2001; Cavalcanti & Robertson, 2002). The main idea behind the proposed approach is to derive a Web site automatically from an application and a related visualisation description. This requires the use of an appropriate formalism, and as we already mentioned, logic is used for this task. However, few people feel comfortable using a general purpose logic directly. One way to deal with this issue is by offering a suitable interface to the
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