

Efficient Circuit Specialization for Dynamic Reconfiguration of FPGAs

Karel Bruneel

Department of Electronics and Information System (ELIS)
Ghent University

Abstract

In many applications, subsequent data manipulations differ only in a small set of parameter values. Because of their reconfigurability, FPGAs (Field Programmable Gate Arrays) can be configured with an specialized circuit every time the parameter values change. This technique is called Dynamic Circuit Specialization. The specialized circuits are smaller and faster than their generic counterparts.

However, the overhead involved in generating the configurations for the specialized circuits at run-time is very large when conventional tools are used and this overhead will in many cases negate the benefit of using optimized configurations.

This presentation introduces an automatic method for generating parameterized configurations from arbitrary Boolean circuits. These configurations, in which some of the configuration bits are expressed as a closed-form Boolean expression of a set of parameters, enable very fast run-time specialization since specialization only involves evaluating these expressions.

Using this automatic and generally applicable method, dynamic circuit specialization suddenly becomes feasible for a large class of applications.

Biography

Since 2005, Karel Bruneel is associated to the Department of Electronics and Information System (ELIS) of Ghent University, where he conducts research in the domain of Computer Aided Design for FPGAs under the supervision of prof. Dirk Stroobandt. In 2011, he obtained the Ph.D. degree in electrotechnical engineering from Ghent University. Since then he continued his research as a post-doc in the ELIS department.