PROJECT PROFILE

A510: Analogue enhancements for a system-to-silicon automated design (ANASTASIA+)

DESIGN METHODOLOGIES

Partners:

Anacad
Analog microelectronics
Atmel
EDSN
Fraunhofer Institut für Techno- und Wirtschaftsmathematik (ITWM)
Infineon Technologies
Melexis
Robert Bosch
Sci-worx
Siemens ICN

Project leader:

Irmtraud Rugen-Herzig, Infineon

Key project dates:

Start: January 2001
End: December 2004

Countries involved:

Austria
France
Germany
Italy

Analogue and mixed analogue-digital signal (A/MS) circuits and systems are used for an ever-growing variety of functions in all areas and particularly automotive electronics, data communications and wireless telecommunications. Europe has a lead in application-specific A/MS chips, but needs to improve design automation to meet increasingly sophisticated market demands in shrinking product life cycles. The goal of MEDEA+ project A510 is to achieve significant improvements in A/MS design automation, covering the complete system environment. Seamless top-down design methods for integrated systems are being developed, as well as tools and methods to achieve a high level of automation and reuse.

Design automation for analogue and mixed analogue-digital circuits and systems lags behind that achieved in the digital area. As most application-specific system-on-chip (SoC) designs include analogue elements, this creates bottlenecks in the overall design process. A major step will be to close the existing gap between system specification and design on one hand, and block-level circuit design on the other.

Simultaneous design of digital and analogue system components requires significant advances on currently available methods and tools in the analogue and mixed-signal domain. While automation tools are available for many individual analogue design stages, no satisfactory solutions yet exist for stepping from one level to the next, nor for system simulations with mixed abstraction levels.

Current tools and modelling languages can be used for either system design or block design, but not for both at the same time. One reason for this is the lack of interfaces between tools used on different levels. Another is that the languages and tools so far available do not yet have the capabilities needed for the description and simulation of all required levels.

MEDEA+ project A510 (ANASTASIA+) aims to create a seamless top-down A/MS design automation method extending from system specification to layout generation for SoC designs to be used in automotive and communications equipment.

As all these applications inevitably require radio frequency (RF) functionality, special emphasis is being placed on the development of modelling, simulation and design techniques for systems that involve both RF and mixed-signal components. An important element of the activity is to create a tool-supported method for designing sigma-delta converters, which play a crucial role in most of the target applications.

A powerful European consortium

ANASTASIA+ builds on results achieved in the ANASTASIA and SADE projects in the 1997 to 2000 MEDEA programme. However, with a more powerful consortium – including tool providers such as Anacad, ITWM and subcontractor ComCAD, as well as a much broader group of application partners – this is more than just a simple follow-up to the previous work.

Moreover, A/MS languages like VHDL-AMS

have only recently matured into well-defined standards, and Anacad is contributing the first commercially available VHDL-AMS simulator. The new languages can thus serve as a true framework for the full design cycle.

As the Semiconductor Industry Association (SIA) roadmap addresses the A/MS and RF sectors only to an inadequate extent, it is unlikely that appropriate efforts will be made in the digitally oriented American commercial electronic design automation (EDA) sector. Consequently, there is a huge opportunity not only to strengthen the position of European system and chip manufacturers, but also to dominate market segments through specialised design know-how.

With A/MS design continuing to mature throughout the project duration, the partners will be able to exert strong influence on international standards through bodies such as VSIA (Virtual Socket Interface Alliance) and IEEE (Institute of Electrical & Electronics Engineers).

Improved design efficiency

Seamless design and verification flow greatly improves design efficiency, enhancing as well as the probability of obtaining first-time-right silicon for SoCs. Project results such as automated modelling and sizing tools, together with reuse oriented layout synthesis methods, are increasing the reusability of analogue functional blocks – markedly reducing design time and increasing design security.

In order to achieve the overall objectives, chip customers participate directly in the system specification process by employing executable behavioural models. Mixed-level, mixed-domain simulation and co-simulation of A/MS systems include analogue and digital semiconductor hardware, together with other components such as sensors, and software.

Greater EDA support will be provided for system specification, block specification refinement, modelling, circuit synthesis, layout generation and reuse in the design process. The development of new algorithms and software tools will permit simultaneous RF/mixed-signal simulation (time and frequency domain), as well as efficient modelling and simulation of the behavioural properties of complex A/MS cells, and computer-aided generation of behavioural models. Reuse-oriented methods for block design will facilitate process migration.

All developments are validated through their use in real product designs. The new methods will be employed in selected demonstrators, such as Bluetooth-based wireless devices and smart sensor systems.

Strengthening European industry

Ultimately, ANASTASIA+ will contribute to securing Europe's competitive strength in several key industrial markets worldwide, including:

- Cars and transportation make a major contribution to employment and economic growth in Europe. However, more and more comprehensive provisions are required to meet increasingly stringent demands for environmental protection, human safety and comfort. With the growing complexity of integrated circuits, complete systems can be built from diminishing numbers of components. As a result, individual ICs will determine to an ever-greater extent the behaviour of entire functional units.
- Communications and data transmission have also opened up completely new opportunities over the past years with ever smaller, cheaper and less power-hungry products. An obvious example is the spread of mobile phones. And even the largely wire-based data communications sector shows enormous growth rates.

In producing the complex ICs needed by these market segments, system and circuit design can no longer be performed separately. Moreover, as sensors and actuators will also need to be integrated, new mixed-signal systems will arise. In future, therefore, end-to-end design will be a crucial factor in enabling European companies to maintain a global technology lead.

Methods developed within ANASTASIA+ will be integrated into processes and systems of the industrial project partners, increasing their design efficiency. The involvement of leading computer-aided design (CAD) companies will likewise contribute to the marketing of new tools based on the project's findings. In addition, publication of the results will enable non-participating companies to also benefit from this research work.

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MEDEA+ focuses on enabling technologies for the Information Society and aims to make Europe a leader in system innovation on silicon for the e-economy.