

Title: Trends and Challenges in EDA

Abstract

The performance of a modern chip depends heavily on the quality of the EDA tools used in the design flow. With the evolution of nanotechnologies, improved EDA tools and algorithms are needed to cope with new fabrication physical requirements, performance constraints, or simply the gigantic number of elements involved. In this tutorial, we will start by giving an overview of the importance of automation in the design process, and then some trends on EDA that are needed to deal with the evolution of manufacturing processes will be presented. Basic and advanced optimization algorithms will be presented for selected problems. An important aspect of the design is to reduce power consumption at all levels of abstraction. Power optimization is fundamental in nanoCMOS and in the IoT world. At logic and physical levels, one approach that can be used to optimize the circuit specially reducing static leakage power is the automation of the cell layout. With on-the-fly cell generation, the same function can be implemented with a reduced number of transistors, requiring less area, and significantly optimizing power and performance. A set of tools and algorithms for cell generation will be briefly discussed. Finally, the use of estimation and visualization tools is equally important, and they can be applied on the design flow or just in the tool's development and research environment as a way to observe and understand the behavior and interactions of algorithms on real designs or benchmarks.

Presenter Biography

Marcelo Johann: Marcelo de Oliveira Johann (Member of IEEE, AES, ICMA, SBC) received his Bachelor (5-years), Masters and the Ph.D. degrees in Computer Science from the Federal University of Rio Grande do Sul (UFRGS), at Porto Alegre, Brazil, in 1992, 1994 and 2001, respectively, having spent 6 months as a visiting student at UCLA, USA, in 1997. He worked as a professor at the Catholic University of Rio Grande do Sul (PUCRS) from 2000 to 2002 and is a full-time professor at UFRGS since 2003. Dr. Johann co-authored 9 book chapters and published more than 70 conference and journal papers mainly in topics related to Electronic Design Automation. His research interests include algorithms for placement, routing, discrete gate sizing, combinatorial optimization, circuits for audio, recording classical music and computer music.

Ricardo Reis: Ricardo Reis received a Bachelor's degree in Electrical Engineering from Federal University of Rio Grande do Sul (UFRGS), Porto Alegre, Brazil, in 1978, and a Ph.D. degree in Microelectronics from the National Polytechnic Institute of Grenoble (INPG), France, in 1983. Doctor Honoris Causa by the University of Montpellier in 2016. He is a full professor at the Informatics Institute of Federal University of Rio Grande do Sul. His main research includes physical design automation, design methodologies, fault tolerant systems and microelectronics education. He has more than 700 publications including books, journals, and conference proceedings. He was vice-president of IFIP (International Federation for Information Processing) and he was also president of the Brazilian Computer Society (two terms) and vice-president of

the Brazilian Microelectronics Society. He is an active member of CASS and he received the 2015 IEEE CASS Meritorious Service Award. He was vice-president of CASS for two terms (2008/2011). He is the founder of the Rio Grande do Sul CAS Chapter, which got the World CASS Chapter of The Year Award 2011, 2012, and 2018, and R9 Chapter of The Year 2013, 2014, 2016, 2017 and 2020. He is a founder of several conferences like SBCCI and LASCAS, the CASS Flagship Conference in Region 9. He was the General or Program Chair of several conferences like IEEE ISVLSI, SBCCI, IFIP VLSI-SoC, ICECS, PATMOS. Ricardo was the Chair of the IFIP/IEEE VLSI-SoC Steering Committee, vice-chair of the IFIP WG10.5 and he is Chair of IFIP TC10. He also started with the EMicro, an annually microelectronics school in South Brazil. In 2002 he received the Researcher of the Year Award in the state of Rio Grande do Sul. He is a founding member of the SBC (Brazilian Computer Society) and, also founding member of SBMicro (Brazilian Microelectronics Society). He was member of CASS DLP Program (2014/2015), and he has done more than 70 invited talks in conferences. Member of IEEE CASS BoG and IEEE CEDA BoG. IFIP Fellow Award.