



Title: Exploiting Spin-Transfer Torque for Non-Volatile Computing

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Abstract

Due to the ever growing multitude of technological obstacles and costs, scaling the feature size of electronic devices further down has been retarding and most likely will halt in the near future. Thus, it is of utmost importance to investigate alternatives to the state-of-the-art CMOS technology. Among the plethora of competing ideas for succession, spintronics (spin electronics) is a very promising technology due to its non-volatility, high endurance, fast operation, and CMOS compatibility. Even though the exploitation of spintronic devices for memory applications matured to a level with first competitive commercial products available, the overall achievable integration density is still not at eye level in comparison to CMOS. This motivated us to shift functionality as much as possible into the spintronic domain in order to reduce the required CMOS overhead for signal conversion. We investigated several high potential ideas which exploit the spin-transfer torque effect for non-volatile computing, with particular emphasis on a non-volatile magnetic flip flop and its application for a non-volatile shift register and a non-volatile buffered magnetic logic gate grid and the use of STT-MRAM for logic-in-memory applications.

Biography

Since 1988 Siegfried Selberherr is a Chair Professor for software technology of microelectronic systems at the TU Wien. After he received his habilitation in 1984, he was a visiting researcher with the Bell-Labs for some time. Since 1996 Prof. Selberherr is a Distinguished Lecturer of the IEEE Electron Devices Society. In the years 1998-2005 he was the Dean of the Faculty of Electrical Engineering and Information Technology. Moreover, since 2001 he is a member of the supervisory board of ams AG and since 2004 a member of the advisory board of the Inter-University Department for Agrobiotechnology (IFA-Tulln). In his scientific career Prof. Selberherr has published, with his teams of researchers, so far over 350 journal papers and over 1000 articles in conference proceedings, of which more than 150 have been with an invited talk. Additionally, he published 2 books and co-edited more than 30 volumes, and he supervised, so far, more than 100 dissertations. He supervised also numerous research projects with semiconductor companies and funding agencies, like the Austrian Science Fund (FWF), the Christian Doppler Research Association (CDG), and the European Research Council (ERC).