Electrical and Human Feedback

How feedback solves some problems and creates new ones in circuits and design groups.

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Extended Abstract (= Appetizer) V1

Outline

1 About the talk

Abstract submitted with the DLP Nomination

Hanspeter's Biography

2 Mind Map of the talk

Status of this document

This is the first version of the extended abstract, to be published on the web site of the IEEE CAS Distinguished Lecturer Program. Its purpose is to serve as an appetizer for people who are looking for DLP speakers to invite.

Abstract used for the DLP Nomination

In this talk, I will give a technical introduction into feedback systems and into advantages and disadvantages of feedback. I will argue that if any electrical feedback is made in a system, then two other systems will also be connected in a feedback loop: the system of all engineers working together in that project, and the system of the designer interacting with all design tools used in the project's tool chain.
The first example mainly shows the technical side of this: the design of an output driver for a micro-electrode array chip (the full-chip design was done by Simon Neukom and Yue-Li Schrag, CSEM Zürich) where the circuit was built on purpose with as little feedback as possible in order to get sufficient results in minimum time. This made it possible to do the electrical design to specifications of a sixteen-channel output block (including Monte-Carlo and corner simulations of noise, dynamic offset, harmonic distortion, crosstalk and settling behaviour) and the layout within *ten working days*, and doing it so successfully that the circuit worked first time right, and could be used with very few modifications on three different ASICs, and be ported with low effort to a different technology for a fourth one.

Abstract continued

The second example mainly discusses the socio-psychological side of feedback: we look at the development of a sigma-delta sensor system, and how the electrical feedback caused feedback through the three design teams involved, how this loop became unstable, and through what measures it could be stabilized. Essentially, I will argue that excessive loop delay destabilizes both a sigma-delta system and a distributed team, and I will talk about how mutual trust can be built up and maintained in a distributed team.

Hanspeter's Biography

Hanspeter Schmid received the diploma in electrical engineering in 1994, the post-graduate degree in information technologies in 1999, and the degree Doctor of Technical Sciences in 2000, all from the Swiss Federal Institute of Technology (ETH Zürich), Switzerland.
He joined the Signal and Information Processing Laboratory of the ETH Zürich as a teaching assistant in 1994 and became a research assistant and junior lecturer in the field of analogue integrated filters. During this time, he also studied some Philosophy of Science.
From 2000-2005, he was an analog-IC designer with Bernafon AG, Switzerland, where he was part of a design team who developed a new IC platform for hearing aids. In this team, he mainly worked on audio low-noise amplifiers, voltage regulators, and a wireless transceiver, and he was also responsible for full-system signal integrity.
Now he is a Research Fellow at the Institute of Microelectronics of the University of Applied Sciences Northwestern Switzerland (IME/FHNW) and a senior lecturer at ETH Zürich (Analog Signal Processing and Filtering). His main research interests are fast low-power circuits (mainly for sensor electronics), signal integrity in analog signal processing, sigma-delta conversion and mixed-analog-digital signal processing. He also does consulting in industry projects.

Biography continued

In addition to performing technical work, he has done training in conflict management and communication, occasionally works as a conflict moderator or facilitator, and he gives communication courses and conflict prevention courses for engineers and for laymen.
Hanspeter Schmid was Analog Signal Processing Technical Committee Co-Chair from 2008–2010; he currently is an Associate Editor of TCAS–I and a member of the ESSCIRC technical committee.

First version of the talk's mind map