

MAE Seminar SERIES

CLOSED-LOOP SYSTEMS IN MEDICINE – WHY NATURE IS CLOSING THE LOOP AND WE SHOULD DO THAT, TOO!

ABSTRACT

This talk will focus on the principles behind closed-loop systems in physiology. Starting with the general concept of homeostasis, we will first cover selected closed loop systems at the organ level. As illustrative examples, we will look at the control loops for temperature and ventilation.

Afterwards, we will introduce categories for closed-loop controlled therapeutic devices and illustrate this with selected examples. We will then move down to the cell level and take a look at physiological closed-loop systems on that scale. Here we will discover negative as well as positive feedback loops.

BIO SKETCH

Steffen Leonhardt holds a M.S. from the University at Buffalo, a Ph.D. in Control Engineering from TU Darmstadt, Germany, and a M.D. from Goethe University, Frankfurt, Germany.

After working as a R&D Manager for Dräger Medical AG&Co KGaA, Lübeck, Germany, he was recruited as a full professor in biomedical engineering by RWTH Aachen University in 2003 and has since then been the Philips endowed Chair of Medical Information Technology.

His research interests include closed loop control and automation in medicine, bioimpedance, unobtrusive sensing and cyber medical systems. His publication record can be found at <https://scholar.google.de/citations?hl=de&user=GZo4lYgAAAAJ>.

Among other duties, Steffen is an associate editor for the Journal of Clinical Monitoring and Computing, the IEEE Transactions on Biomedical Circuits and Systems, the IEEE Journal of Biomedical and Health Informatics and the journal Biomedical Engineering / Biomedizinische Technik.

From 2015–2018, Steffen has been serving as the president of the International Society for Bioelectromagnetism and as an IEEE EMBS distinguished Lecturer from 2015–2016. In 2018, he was awarded the doctor honoris causa from Czech Technical University in Prague, Czech Republic. Furthermore, he has been appointed a distinguished professor at IIT Madras, Chennai, India.

Steffen is a Fellow of the North Rhine-Westphalian Academy of Sciences, Humanities and the Arts, Düsseldorf, Germany.

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