

Elektrotechnik-Elektronik-Informationstechnik

EEI KOLLOQUIUM

Blood, Brains and Biofilms: Investigations of Molecular Communication in Biology

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Molecular communication (MC) engineering is inspired by the use of chemical signals in cell biology as information carriers. The biological nature of chemical signaling makes MC a promising methodology for interdisciplinary applications requiring communication between cells and other microscale devices. There have been many contributions to understand how MC signals propagate. However, it has been a challenge for these contributions to make an impact beyond communications engineering research. Obstacles include the complexity of "real-world" environments and the diversity of implementations in nature.

In this talk, we share our on-going work to apply molecular communication techniques to practical biological systems with collaborators in biology, medicine, and the pharmaceutical industry. We start from a hierarchical framework for mapping biophysical propagation and processing to a communication-theoretic representation. We then present several case studies where we try to understand how molecular communication is used and could be controlled in different biological environments. These examples include signaling over water channel networks inside biofilms, transport of regulatory proteins in neurons, and delivery of nutrients to organoids in organ-on-chip systems..