The Hebrew University Center for Nanoscience & Nanotechnology

Nano Seminar

From Photoelectrochemical Switches to Musical Harmonies:
Serendipitous Relationships

Prof. Konrad Szaciłowski

AGH University of Science and Technology, Kraków, Poland

Abstract:

 Digital electronics is so widely used in everyday life that it is almost impossible to find an electric device that does not make use of digital electronic components. On average, 85% of the circuitry in all the electronic devices is digital and only 15% is analogue. Digital systems are much less sensitive to any interference due to wide margins of allowed signal values resulting from highly nonlinear characteristics. On the other hand, the whole Nature acts in a nonlinear, but highly analogue manner and all possible variables of any natural system may have much more possible values than just two. Therefore we want to develop sensing and information processing devices devoid of limitations of binary digital systems, but having similar robustness.

Sensing and information processing can be considered as two sides of a coin. They are strictly bound together at the formal and functional level. Sensing usually translates one form of information into another one (with possible amplification) and also extracts the useful signals from the background. It corresponds to translation of information from syntactic to semantic and pragmatic levels. Apart from classical (monolithic semiconductor-based) approaches to information processing, various nanoscale and molecular approaches have been suggested. One on the successful (at least at laboratory scale) approaches uses semiconducting nanoparticles decorated with various molecular species, especially coordination compounds. They are perfectly suited for these applications due to their structural diversity, optical properties and photophysical activity. This contribution presents an overview of photoelectrochemical systems with diverse functionalities from binary logic gates and photoelectrochemical ion sensors, through ternary and fuzzy logic systems, to neuromimetic information processing, reservoir computing and analysis of musical harmony and tonality.
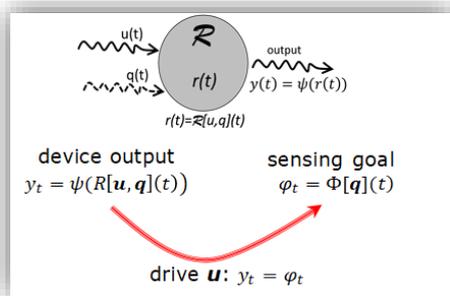
Fig. 1. The principle of operation of reservoir computer

References
Z. Konkoli "On developing theory of reservoir computing for sensing applications: the state weaving environment echo tracker (SWEET) algorithm" *Int. J. Parallel Emergent Dist. Syst.* **2016**, 1241880.
V. Athanasiou, Z. Konkoli, "On using reservoir computing for sensing applications: exploring environment-sensitive memristor networks" *Int. J. Parallel Emergent Dist. Syst.* **2017**, 1287264.

Gathering & Refreshments at 10:50
Please contact Alexandra Bannych at 6584919 if you are interested in meeting the lecturer.

Tuesday, Oct 31st 2017, 11:00 at the Seminar Hall
Los Angeles Building, entrance floor.