

# PHYSIOLOGICAL CYBERNETICS: METHODS AND APPLICATIONS

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**Summary:** Cybernetics is the term used by Wiener in 1948 to denote “the unity of the set of problems centering about communication, control and statistical mechanics, whether in the machine or in the living tissue”. Physiological cybernetics is a research field aiming at an interdisciplinary approach to face biomedical problems; it considers models able to describe physiological systems using the feedback theory and, more in general, the system analysis. Homeostasis is the capacity of the body to preserve relatively constant physiological conditions and control actions are the basis for its maintenance; the control theory is the natural framework to describe physiological systems and their regulation mechanisms.

The research on physiological cybernetics applies mathematics to provide a support for testing therapeutic protocols and helping medical diagnosis.

This talk will discuss the methods of control theory applied to physiological systems; they are generally nonlinear and time invariant, thus requiring the hard task of model balance complexity. Important key differences between engineering and physiological control systems will be discussed; in particular, the “components” of a physiological control system are generally unknown or difficult to analyze and, moreover, the system to be controlled is a controller itself. Examples and applications will be presented.