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The Fuzzy Modeling Approach for Qualitative Description of Biological Systems

It is believed that most of biological procedures cannot be fully described by quantitative dynamical models, since biological systems are hierarchical and highly interconnected and the size of a quantitative model grows with the complexity of the system. On the other hand, restricting the model to a small set of variables inevitably leads to an often unacceptable level of uncertainty in the inference. Modeling of complex systems involves two kinds of uncertainty, one type is randomness which models stochastic variability; the other is fuzziness which models measurement imprecision due to incomplete information or linguistic structure. Numerous biological phenomena is described and explained linguistically by human observers. The derivation of suitable mathematical models is a necessary step in order to study these phenomena in a systematic manner. Fuzzy modeling is the most effective approach for transforming linguistic data into mathematical formulas and vice versa. This talk demonstrates the advantages of using fuzzy modeling to analyze, simulate, test the influence of parameters, and predict the behavior of the system.