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NETWORK STRUCTURES DYNAMICS. SOME BIOLOGICAL APPLICATIONS

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The network theory succeeded to apply the mathematical results of graph theory to describe the complex structures of big dataset provided by biological, economic and social systems. Recently the dynamical nature of the empirical observations has pointed out the necessity of introducing a dynamical structure on the considered interaction networks both to study the features of equilibrium solutions and to define new dynamical observables which allow to measure the resilience or frailty of the observed systems[1]. We present a mathematical description of a network structure starting from the concept of *landscape potential*[2] . Then we introduce a dynamics into this network structure by means of a Master Equation and we characterize some properties of the network using the eigenvalue spectral distribution of the associated stochastic matrix. In particular we are interested in the resilience of the stationary states and in the estimate relaxation time scales. Afterward we give some biological applications to understand the emergence of universal statistical laws as the relative species abundance distribution and the resilience of ecosystems[3].

References

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