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Mathematical Models of the Evolution of Species.

In this talk, we apply a new approach to a special class of discrete-time evolution models and establish a solid mathematical foundation to analyze them. We propose new single and multi-species evolutionary competition models using the evolutionary game theory that require a more advanced mathematical theory to handle effectively. The new approach is to consider the discrete models as non-autonomous difference equations and alternatively as triangular maps. We embed the non-autonomous difference equations in autonomous discrete dynamical systems in a higher dimension space, which is the product space of the phase space and the space of the functions defining the non-autonomous system. Our current approach applies to two scenarios. In the first scenario, we assume that the trait equations are decoupled from the equations of the populations. This requires specialized biological and ecological assumptions. In the second scenario, we do not assume decoupling, but we assume that the dynamics of the trait is known. For instance, in the latter case, we assume that the trait approaches a positive stable equilibrium point. This latter case may apply to a much broader evolutionary dynamics. (Received September 15, 2020)