STABILITY OF EQUILIBRIUM STATES FOR A STOCHASTICALLY PERTURBED MOSQUITO POPULATION EQUATION

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Abstract. In the paper it is shown how the known results of stability theory can be simply applied to stability investigation of some nonlinear mathematical models with stochastic perturbations. The known discrete delay Mosquito population equation with an exponential nonlinearity is considered. It is assumed that this model is exposed to stochastic perturbations which are directly proportional to the deviation of a system state from an equilibrium point. The necessary and sufficient conditions for asymptotic mean square stability of two (zero and positive) equilibrium points of a linear approximation of the considered stochastic difference equations are obtained. These conditions at the same time are sufficient conditions for stability in probability of equilibrium points of the initial nonlinear equation. Numerical calculations and figures illustrate the obtained results. The proposed investigation procedure can be applied for arbitrary nonlinear equations with an order of nonlinearity higher than one.

Keywords. Mosquito population equation, equilibrium points, stochastic perturbations, stability in probability, asymptotic mean square stability

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