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Short Communication

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On The Stability of the Obesity Epidemic Model and Many Similar Other: A Survey of Some Applications of One Method

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Social obesity epidemic model is described by the system of three non-linear integro-differential equations with the order of nonlinearity higher than one and with distributed delays [1]. The proposed method of stability investigation of equilibrium points of systems of such type by stochastic perturbations is general enough and can be used for stability investigation of equilibriums of many other similar systems in different applications: the alcohol consumption model, SIR epidemic model, models of the type of predator-prey, Nicholson's blowies equation, virus dynamics, mosquito and glassy-winged sharpshooter populations, cancer treatment model, model of e-commerce, well known in economics neoclassical growth model and many-many similar other [2-15].

The main stages of the proposed investigation method are the following. It is supposed that the considered deterministic system has an equilibrium point (one or more) and inuenced by stochastic perturbations of the white noise type that are directly proportional to the system state deviation from the equilibrium point. By that the equilibrium point of the initial deterministic system is the equilibrium point of the stochastic system too. The constructed stochastic system is linearized in the neighborhood of the point of the equilibrium and the zero solution of the auxiliary linear system is investigated for the asymptotic mean square stability. Sufficient conditions for the asymptotic mean square stability, obtained using the general method of Lyapunov functional construction [16, 17], are also sufficient conditions for stability in probability of the initial nonlinear system equilibrium under stochastic perturbations.

In details this method of stability investigation under stochastic perturbations is described for difference equations and for differential equations in and respectively [16, 17]. Instead of stochastic perturbations of the white noise type can be used also stochastic perturbations of the type of Poisson's jumps [15].

Note that besides of the author with his colleagues this method with stochastic perturbations of the proposed form was successfully used for stability investigation of different applied mathematical models by other independent researches. See, for instance: model for phage-bacteria interaction, predator-prey model, model of cancer, model of virus-tumor immune system, vector-borne disease models [18-22].

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