Mathematical Modeling of Nonlinear Process of Assimilation

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Abstract : In work the new nonlinear mathematical model describing assimilation of the people (population) with some less widespread language by two states with two various widespread languages, taking into account demographic factor is offered. In model three subjects are considered: the population and government institutions with the widespread first language, influencing by means of state and administrative resources on the third population with some less widespread language for the purpose of their assimilation; the population and government institutions with the widespread second language, influencing by means of state and administrative resources on the third population with some less widespread language for the purpose of their assimilation; the third population (probably small state formation, an autonomy), exposed to bilateral assimilation from two rather powerful states. Earlier by us it was shown that in case of zero demographic factor of all three subjects, the population with less widespread language completely assimilates the states with two various widespread languages, and the result of assimilation (redistribution of the assimilated population) is connected with initial quantities, technological and economic capabilities of the assimilating states. In considered model taking into account demographic factor natural decrease in the population of the assimilating states and a natural increase of the population which has undergone bilateral assimilation is supposed. At some ratios between coefficients of natural change of the population of the assimilating states, and also assimilation coefficients, for nonlinear system of three differential equations are received the two first integral. Cases of two powerful states assimilating the population of small state formation (autonomy), with different number of the population, both with identical and with various economic and technological capabilities are considered. It is shown that in the first case the problem is actually reduced to nonlinear system of two differential equations describing the classical model "predator - the victim", thus, naturally a role of the victim plays the population which has undergone assimilation, and a predator role the population of one of the assimilating states. The population of the second assimilating state in the first case changes in proportion (the coefficient of proportionality is equal to the relation of the population of assimilators in an initial time point) to the population of the first assimilator. In the second case the problem is actually reduced to nonlinear system of two differential equations describing type model "a predator – the victim", with the closed integrated curves on the phase plane. In both cases there is no full assimilation of the population to less widespread language. Intervals of change of number of the population of all three objects of model are found. The considered mathematical models which in some approach can model real situations, with the real assimilating countries and the state formations (an autonomy or formation with the unrecognized status), undergone to bilateral assimilation, show that for them the only possibility to avoid from assimilation is the natural demographic increase in population and hope for natural decrease in the population of the assimilating states.

Keywords : nonlinear mathematical model, bilateral assimilation, demographic factor, first integrals, result of assimilation, intervals of change of number of the population

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