Periodic boundary value problem for a system of ordinary differential equations with impulse effects

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Abstract: In this work, we investigated a nonlinear periodic boundary value problem with impulse effects. We have found conditions of existence isolated solution of periodic boundary value problem for system of nonlinear differential equations with impulse effects.

We consider the following periodic boundary value problem for a system of nonlinear ordinary differential equations with impulse effects on $[0, T]$:

$$dx/dt = f(t, x), \quad t \in [0, T] \setminus \{\theta_1, \theta_2, \dots, \theta_m\}, \quad x \in R^n,$$

$$0 = \theta_0 < \theta_1 < \dots < \theta_{m+1} = T, \tag{1}$$

$$x(0) = x(T), \tag{2}$$

$$x(\theta_i + 0) - x(\theta_i - 0) = J_i\left(\lim_{t \to \theta_i - 0} x(t)\right), \qquad i = \overline{1, m}, \tag{3}$$

where $f : [0, T] \times R^n \to R^n$, is a piecewise-continuous vector valued function with points of discontinuity of the first kind at $t = \theta_i \, (i = \overline{1, m})$ and $J_i(x)$ $(i = \overline{1, m})$ are continuous vector valued functions of x. Many authors discuss solvability of problem (1) - (3) [1–5]. Sufficient conditions for the existence of isolated solutions periodic boundary value problem of impulsive.

Keywords: Impules effects, boundray value, differential equation

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References

[1] A. M. Samoilenko, and N. A. Perestyuk, "Impulse Differential Equations" *Vyshcha Shkola*, Kiyv, 1987, p. 405.

[2] A. M. Samoilenko, and N. I. Ronto, "Numerical-Analytic Methods for the Investigation of the Solutions of Boundary-Value Problems" *Naukova Dumka*, Kiyv, 1986, p. 565.

[3] E. Liz, and J. Nieto, "Positive solutions of linear impulsive differential equations" *Communications in applied analysis* **2**, 565 – 571 (1998).

[4] D. S. Dzhumabaev, and S. M. Temesheva, "A Parametrization Method for Solving Nonlinear Two-Point Boundary Value Problems" *Computational Math. and Math. physics* **47**, 37–61 (2007).

[5] D. S. Dzhumabayev, "Criteria for the unique solvability of a linear boundary-value problem for an ordinary differential equation" *USSR Computational Math. and Math. Physics* **29**, 34–46 (1989).