

Periodic solution of linear autonomous dynamic system

Serikbai A. Aisagaliev, Zhanat Kh. Zhunussova

Abstract A method for the study of periodic solutions of autonomous dynamic systems described by ordinary differential equations with phase and integral constraints is supposed. General problem of periodic solution is formulated in the form of the boundary value problem with constraints. The boundary problem is reduced to the controllability problem of dynamic systems with phase and integral constraints by introducing a fictitious control. Solution of the controllability problem is reduced to a Fredholm integral equation of the first kind. The necessary and sufficient conditions for existence of the periodic solution are obtained and an algorithm for constructing periodic solution to the limit points of minimizing sequences is developed. Scientific novelty of the results consists in a completely new approach to the study of periodic solutions for linear systems focused on the use of modern information technologies is offered. The existence of periodic solution and its construction is solved together.

1 Problem statement

We consider a linear autonomous system

$$\dot{x} = Ax, t \in (-\infty, +\infty), \quad (1)$$

where A is a constant matrix of $n \times n$ order. The problems are set:

Problem 1. Find necessary and sufficiently conditions for existence T_* periodic solution of system (1).

Problem 2. Find T_* periodic solution of system (1)

Solving these problems is of interest for system (1) of $(n > 4)$ higher order.

Serikbai A. Aisagaliev, Zhanat Kh. Zhunussova
Al-Farabi Kazakh National University, al-Farabi avenue 71, Almaty, 050040, Kazakhstan, e-mail:
Serikbai.Aisagaliev@kaznu.kz, e-mail: zhanat.zhunussova@kaznu.kz