Jorba, Àngel; Simó, Carles

On the reducibility of linear differential equations with quasiperiodic coefficients. (English)

Zbl 0761.34026
J. Differ. Equations 98, No. 1, 111-124 (1992).

We say that a matrix $Q(t)$ is a quasiperiodic matrix of time with basic frequencies $\omega_1, \ldots, \omega_r$ if $Q(t) = F(\omega_1 t, \ldots, \omega_r t)$, where $F = F(v_1, \ldots, v_r)$ is 2π periodic in all its arguments. The author considers the system (1) $x' = (A + \varepsilon Q(t))x$, where A is a constant matrix and $Q(t)$ is a quasiperiodic analytic matrix with r basic frequencies. Suppose A has different eigenvalues (including the purely imaginary case) and the set formed by the eigenvalues of A and the basic frequencies of $Q(t)$ satisfies a nonresonant condition. It is proved under a nondegeneracy condition that there exists a Cantorian set $\mathcal{S} \subset (0, \varepsilon_0)$ $(\varepsilon_0 > 0)$ with positive Lebesgue measure such that for $\varepsilon \in \mathcal{S}$ (1) is reducible (i.e. there exists a nonsingular quasiperiodic matrix $P(t)$ such that $P(t)$, $P^{-1}(t)$ and $P'(t)$ are bounded on R and the change of variables $x = P(t)y$ transforms (1) to $y' = By$ with a constant matrix B).

Reviewer: S.Staněk (Olomouc)

MSC:

34C20 Transformation and reduction of ordinary differential equations and systems, normal forms
34A30 Linear ordinary differential equations and systems
34C27 Almost and pseudo-almost periodic solutions to ordinary differential equations

Keywords:

quasiperiodic function; reducible system; basic frequencies

Full Text: DOI

References:

[1] Arnol'd, V.I, Small denominators and problems of stability of motion in classical and celestial mechanics, Russian math. surveys, 18, No. 6, 85-191, (1963) · Zbl 0135.42701

[2] Bogoljubov, N.N; Mitropoliski, Ju.A; Samoilenko, A.M, Methods of accelerated convergence in nonlinear mechanics, (1976), Springer-Verlag New York

[3] Fink, A.M, Almost periodic differential equations, () · Zbl 0325.34039

[4] Johnson, R.A; Sell, G.R, Smoothness of spectral subbundles and reducibility of quasi-periodic linear differential systems, J. differential equations, 41, 262-288, (1981) · Zbl 0443.34037