Driver, R. D.

A mixed neutral system. (English) Zbl 0553.34042

Nonlinear Anal., Theory Methods Appl. 8, 155-158 (1984).

Consider a mixed type neutral system (1) $x'(t) = f(t,x) + \sum_{j=1}^{m} F_j(t,x)x'(t+P_j)$, (2) $x(0) = x_0$, where f is a continuous n-vector-valued functional, each F_j is a continuous $n \times n$ matrix-valued function defined on $R \times C(R,R^n)$, each P_j is a constant real number and $x_0 \in R^n$. It is also assumed that $|\cdot|$ is a norm in R^n, $\|\cdot\|$ the induced matrix norm and P, M_f, M_F, K_f and K_F are positive constants such that $|f| \le M_f$, each $\|F_j\| \le M_F$ on $R \times C(R,R^n)$, $P = \max_j |P_j|$ and for all $t \in R$, with x, $\tilde{x} \in C(R,R^n)$, $|f(t,x) - f(t,\tilde{x})| \le K_f \max_{t-p \le s \le t+p} |x(s) - \tilde{x}(s)|$ and $\|F(t,x) - F(t,\tilde{x})\| \le K_F \max_{t-p \le s \le t+p} |x(s) - \tilde{x}(s)|$. The author proves that if P, M_f, M_F, K_f and K_F are sufficiently small and for any constant $a > 0$

$$e^{ap}[(1/a)(K_f + (mK_F M_f)/(1 - mM_F)) + mM_F] < 1$$

then (1) and (2) have a unique solution such that $\int_t^{t+1} |x'(s)| ds$ is bounded for all t. An example is given, to illustrate the theory.

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References:

[1] Czerwik, S., On the global existence of solutions of functional-differential equations, Period. math. hungar., 6, 347-351, (1975) · Zbl 0322.34050

[2] Driver, R.D., Existence and continuous dependence of solutions of a neutral functional-differential equation, Archs ration. mech. analysis, 19, 149-166, (1965) · Zbl 0148.05703

[3] Driver, R.D., Point data problems for functional differential equations, (), 115-121

[4] Driver, R.D.; Driver, R.D., Erratum, Phys. rev. D, Phys. rev. D, 20, 2639-1107, (1979)

[5] Fite, W.B., Properties of the solutions of certain functional differential equations, Trans. am. math. soc., 22, 311-319, (1921) · Zbl 48.0534.01

[6] Polossuchin, O., Über eine besondere klasse von differentialen funktionalgleichungen, () · Zbl 41.0444.11

[7] Robertson, M.L., Concerning Siu's method for solving \textit{y}⊠(t) = F(t,y(g(t))), Pacif. J. math., 59, 223-227, (1975) · Zbl 0325.34078

[8] Smítalová, K., Existence of solutions of functional-differential equations, Časopis Pést. mat., 100, 261-264, (1975) · Zbl 0314.34070