cases	doc_1	doc_2
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title	EXISTENCE OF PERIODIC SOLUTIONS FOR A SECOND ORDER NONLINEAR NEUTRAL FUNCTIONAL DIFFERENTIAL EQUATION	Existence of periodic solutions for first-order totally nonlinear neutral differential equations with variable delay
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id	id-7486091728476523865	id-3454279600008381480
abstract	We study the existence of periodic solutions of the second order nonlinear neutral differential equation with variable delay xâ€²â€² (t) + p (t)xâ€² (t) + q (t)h (x (t)) = c (t)xâ€² (tâˆ' Ï„ (t)) + f (t, x (tâˆ' Ï„ (t))) . We invert the given equation to obtain an integral, but equivalent, equation from which we define a fixed point mapping written as a sum of a large contraction and a compact map. We show that such maps fit very nicely into the framework of Krasnoselskii-Burtonâ€™s fixed point theorem so that the existence of periodic solutions is conclued.	We use a modification of Krasnoselskii's fixed point theorem due to Burton (see [Liapunov functionals, fixed points and stability by Krasnoselskii's theorem, Nonlinear Stud. 9 (2002), 181--190], Theorem 3) to show that the totally nonlinear neutral differential equation with variable delay \begin{equation*} x'(t) = -a(t)h (x(t)) + c(t)x'(t-g(t))Q'(x(t-g(t))) + G (t,x(t),x(t-g(t))), \end{equation*} has a periodic solution. We invert this equation to construct a fixed point mapping expressed as a sum of two mappings such that one is compact and the other is a large contraction. We show that the mapping fits very nicely for applying the modification of Krasnoselskii's theorem so that periodic solutions exist.
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