Bounded and periodic solutions of infinite delay evolution equations

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Abstract: For A(t) and f(t, x, y) T-periodic in t, we consider the following evolution equation with infinite delay in a general Banach space X: $u'(t) + A(t)u(t) = f(t, u(t), u_t)$, $t > 0$, $u(s) = \varphi(s)$, $s \leq 0$, (0.1) where the resolvent of the unbounded operator A(t) is compact, and $u_t(s) = u(t + s)$, $s \leq 0$. By utilizing a recent asymptotic fixed point theorem of Hale and Lunel (1993) for condensing operators to a phase space C_g, we prove that if solutions of Eq. (0.1) are ultimate bounded, then Eq. (0.1) has a T-periodic solution. This extends and improves the study of deriving periodic solutions from boundedness and ultimate boundedness of solutions to infinite delay evolution equations in general Banach spaces; it also improves a corresponding result in J. Math. Anal. Appl. 247 (2000) 627-644 where the local strict boundedness is used.

Author Keywords: Bounded and periodic solutions; Condensing operators; Hale and lunel's fixed point theorem; Infinite delay

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References:

- Amann, H., Periodic solutions of semi-linear parabolic equations (1978) Nonlinear Analysis, A Collection of Papers in Honor of Erich Roth, pp. 1-29. , Academic Press, New York
- Burton, T., (1985) Stability and Periodic Solutions of Ordinary Differential Equations and Functional Differential Equations, pp. 197-308. , Academic Press
- Hale, J., Lunel, S., (1993) Introduction to Functional Differential Equations, pp. 113-119. , Springer-Verlag, New York
- Henriquez, H., Periodic solutions of quasi-linear partial functional differential equations with unbounded delay (1994) Funkcial. Ekvac., 37, pp. 329-343
- Liu, J., Bounded and periodic solutions of semi-linear evolution equations (1995) Dynam. Systems Appl., 4, pp. 341-350
- Liu, J., Bounded and periodic solutions of finite delay evolution equations (1998) Nonlinear Anal., 34, pp. 101-111
- Liu, J., Periodic solutions of infinite delay evolution equations (2000) J. Math. Anal. Appl., 247, pp. 627-644
- Pazy, A., (1983) Semigroups of Linear Operators and Applications to Partial Differential Equations, pp. 60-212. , Springer-Verlag, New York