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**Periodic solutions in fading memory spaces.** (English) Zbl 1157.34346

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Summary: For  $A(t)$  and  $f(t, x, y)$   $T$ -periodic in  $t$ , consider the following evolution equation with infinite delay in a general Banach space  $X$ ,

$$u'(t) + A(t)u(t) = f(t, u(t), u_t), \quad t > 0, \quad u(s) = \phi(s), \quad s \leq 0,$$

where the resolvent of the unbounded operator  $A(t)$  is compact, and  $u_t(s) = u(t + s)$ ,  $s \leq 0$ . We will work with general fading memory phase spaces satisfying certain axioms, and derive periodic solutions. We will show that the related Poincaré operator is condensing, and then derive periodic solutions using the boundedness of the solutions and some fixed point theorems. This way, the study of periodic solutions for equations with infinite delay in general Banach spaces can be carried to fading memory phase spaces.

**MSC:**

**34K13** Periodic solutions to functional-differential equations

**34K30** Functional-differential equations in abstract spaces

Cited in **1** Document

**Keywords:**

Infinite delay; fading memory phase space; bounded and periodic solutions; condensing operators; Hale and Lunel's fixed point theorem