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Regularity of solutions to partial differential delay equations

In the context of the partial differential delay equation $\dot{u}(t) + Bu(t) = F(u_t)$ for $t \geq 0$, with $u_{|I} = \varphi \in E = BUC(I, X)$, with $B : D(B) \subset X \to X$ linear $\omega-$m-accretive, X Banach, $F : \hat{E} \subset E \to X$ (history control), and $I \in \{[-R, 0], (-\infty, 0]\}$, we consider the problem under which 'smoothness' assumptions on the history-operator F and the initial history φ a) the mild solution to the equation is actually a classical solution, and b) its time-derivative is a mild solution to a linearisation of the original equation. The proof of the result is carried out by inspecting differentiability of (a motion of) the (nonlinear) solution semigroup associated to the equation in the initial history space E. Typical applications for the abstract equation are models of population dynamics.