An application of abstract functional differential equations

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Abstract

A singular transport equation modelling a proliferating maturity structured cell population

\[
\frac{\partial u(x,t)}{\partial t} + \frac{\partial (xu(x,t))}{\partial x} = \mu u(\alpha x, t - \tau)(1 - u(\alpha x, t - \tau)), \quad (E)
\]

\[
0 \leq x \leq 1, \quad t > 0
\]

\[
u(x,t) = \varphi(x,t), \quad 0 \leq x \leq 1, \quad -\tau \leq t \leq 0,
\]

was investigated by J. Dyson, R. Villella-Bressan, G. F. Webb, [1], also in the more abstract version

\[
W(u_t)(x) = \mu u(\alpha x, t - \tau)(1 - u(\alpha x, t - \tau)). \quad (1)
\]

We investigate a more general abstract version

\[
u'(t) = -\mathcal{A}(u(t)) + W(u_t), \quad t > 0, \quad u(0) = \varphi(0, t), \quad \text{if} \quad -\tau \leq t \leq 0,
\]

where

\[
\mathcal{A} : \{W \in \mathcal{C}([0,1]) \mid id_{\mathbb{R}}W \in \mathcal{C}^1([0,1])\} \rightarrow \mathcal{C}([0,1]), \quad W \mapsto (id_{\mathbb{R}}W)'.
\]

References
