

# New Convergence Results for Solutions to a Class of Second Order Nonhomogeneous Evolution Equations

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## Abstract

We consider the following class of second order nonhomogeneous evolution equations

$$\begin{cases} u''(t) + cu'(t) \in Au(t) + f(t) & \text{a.e. } t \in (0, +\infty) \\ u(0) = u_0, \sup_{t \geq 0} |u(t)| < +\infty \end{cases}$$

where  $A$  is a maximal monotone operator in a real Hilbert space  $H$ ,  $c$  is a real number, and  $f : \mathbb{R}^+ \rightarrow H$  is a given function. In this talk, first we review our previous work where we showed that when  $c \leq 0$ , with suitable conditions on  $f$ ,  $u(t)$  is always weakly convergent to an element of  $A^{-1}(0)$ , and strong convergence may not occur in general. Then we present our recent result, stating that for  $c > 0$ , amazingly the solution always converges strongly to an element of  $A^{-1}(0)$ . This result is new, even for ordinary differential equations in one dimension. Some applications will be also presented.

Keywords and phrases. Second order evolution equation, nonhomogeneous, monotone operator, asymptotic behavior, almost nonexpansive curve, strong convergence theorem.

2000 AMS Subject Classification. Primary 47J35, 34G25; Secondary 47H05, 47H04