Nonlinear Dynamics and Systems Theory, **17** (3) (2017) 239–246

Maximal Regularity of Non-autonomous Forms with Bounded Variation

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Received: July 28, 2016; Revised: July 28, 2017

Abstract: We are concerned with the non-autonomous evolutionary problem

$$(P)\begin{cases} \dot{u}(t) + A(t)u(t) = f(t), & t \in [0, \eta], \\ u(0) = u_0. \end{cases}$$

Each operator $A(t)$ is associated with a symmetric sesquilinear form $\mathfrak{a}(t; ., .)$ on a Hilbert separable space $(H, \|\cdot\|)$. We show that the approximation method considered in [13] to redemonstrate the maximal regularity in H, is still valid to prove this property if the sesquilinear form is symmetric and time bounded variation. This result was already established in [5].

Keywords: *sesquilinear forms; non-autonomous evolution equations; maximal regularity.*

Mathematics Subject Classification (2010): 35K90, 35K50, 35K45, 47D06.

1 Introduction

Let $(H, \|\cdot\|)$ and $(V, \|\cdot\|_V)$ be Hilbert separable spaces such that V is continuously and densely embedded in H, $V \underset{d}{\hookrightarrow} H$. Let V' be the anti-dual of V and denote by $(.|.)$ the scalar product of H and by $\langle .; . \rangle$ the duality pairing $V' \times V$. By the standard identification of H with H' we obtain the continuous and dense embedding

$$V \underset{d}{\hookrightarrow} H \simeq H' \underset{d}{\hookrightarrow} V'.$$

Moreover, it is shown in [4] that there exists a constant c_H such that

$$\begin{aligned} & \|u\| \leqslant c_H \|u\|_V \quad \text{for all} \quad u \in V \\ \text{and} \quad & \|f\|_{V'} \leqslant c_H \|f\| \quad \text{for all} \quad f \in H. \end{aligned}$$

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