

# On a linear neutral integro-differential equation

A.D. Ioannidis

Suppose that we are given

- a Banach space  $X$ ,
- linear operators  $A, B, (K(t))_{t \geq 0}$  in  $X$ , and
- an  $x \in X$ .

We study the following initial value problem: to find a function  $u : \mathbb{R}_+ \rightarrow X$  which satisfies

$$\begin{cases} \frac{d}{dt} \left( Bu(t) - \int_0^t K(t-s)u(s) ds \right) = Au(t), & t \geq 0 \\ u(0) = x \end{cases} \quad (\text{IVP})$$

We pay special attention in the case when  $A$  is the generator of a  $C_0$ -semigroup. Our aim is to find conditions on  $B, K(\cdot)$  and  $x$  in order (IVP) to be well-posed. The idea is, by using a variation-of-constants procedure, to rewrite (IVP) as a Volterra integral equation in  $X$ .

This work uses results from the author's PhD thesis and is an abstraction of a problem arising in Electromagnetic Theory. Collaboration with G. Kristensson and I. Stratis is acknowledged.