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Liapunov Functionals, Convex Kernels, and Strategy

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Abstract: We study an integral equation of the form $x(t) = a(t) - \int_0^t C(t,s)g(x(s))ds$ where C is convex and g has the sign of x. In earlier work we treated the case of $\sup \int_s^t C^2(u,s)du =: \Gamma < \infty$. Here, we study the case of $\Gamma = \infty$ by looking at a new equation formed from $x' + kx$ with k a positive constant. This enables us to define a Liapunov functional which will give a bound on $\int_0^t g^2(x(s))ds$ and a parallel bound on one of the resolvents in the linear case. Equations of this type have been used since the early work of Volterra in a number of real-world problems.

Keywords: *integral equations; Liapunov functionals; resolvents.*

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