

# THE NUMERICAL SOLUTION OF FORWARD-BACKWARD DIFFERENTIAL EQUATIONS: DECOMPOSITION AND RELATED ISSUES

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We consider mixed-type functional differential equations (MFDEs), also referred to as forward-backward equations, of the form

$$x'(t) = a(t)x(t) + b(t)x(t - 1) + c(t)x(t + 1).$$

In earlier work we used  $\theta$ -methods to solve the autonomous equation (i.e.  $a(t), b(t)$  and  $c(t)$  are constants) subject to specified boundary conditions. Here we extend our approach to the non-autonomous problem.

For the autonomous form of the equation we develop a numerical approach based on existing analytical results concerning the decomposition of the solution.

Equations admitting *small solutions* pose additional problems. We review our existing work on detecting the presence of small solutions to delay differential equations with a view to gaining insight into MFDEs admitting small solutions.

We will present examples to illustrate our numerical approach.

## REFERENCES

- [1] Neville J. Ford, Patricia M. Lumb. Mixed-type functional differential equations: A numerical approach. *Journal of Computational and Applied Mathematics*, 2008. (to appear)