

Bilinear state systems on an unbounded time scale

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We demonstrate the existence and uniqueness of solutions to a bilinear state system with locally essentially bounded coefficients on an unbounded time scale. We obtain a Volterra series representation for these solutions which is norm convergent and uniformly convergent on compact subsets of the time scale. We show the associated state transition matrix has a similarly convergent Peano-Baker series representation and identify a necessary and sufficient condition for its invertibility. Finally, we offer numerical applications for dynamic bilinear systems - a frequency modulated signal model and a two-compartment cancer chemotherapy model.