Title: Convergence of theta-method for time-variable equations

Associated People:
Elena Braverman (University of Calgary)

Associated Sites:
PIMS University of Calgary

Associated PIMS Programs:
PIMS CRG on Applied and Computational Harmonic Analysis

If a vector is obtained by a repetitive matrix iteration, then it tends to zero, once the maximal by the absolute value eigenvalue of the matrix is inside the unit circle. This is not true anymore for a sequence of variable matrices. The recently published paper by University of Calgary mathematician Elena Braverman, together with the exchange PhD student from Turkey Ba\c{s}ak Karpuz, considers the stability problem when some of the iteration matrices may have large eigenvalues. The original problem which is a high order difference equation can also include nonlinearities. Sufficient stability conditions are obtained and applied to the analysis of the theta finite difference scheme which is the simplest semi-implicit generalization of the Euler method. Depending on the values of the parameter h which describes the step size, scalar solutions can converge to zero in a monotone or oscillatory way, or diverge.

References
- E. Braverman and B. Karpuz, On global asymptotic stability of nonlinear higher-order difference equations, *Journal of Computational and Applied Mathematics* **236** (2012), 2803-2812.