Final Project Proposal: A Comparison of Analytic Tools for the Finite Difference and Finite Element Methods with Parabolic Equations

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For my final project, I would like to apply some of the finite difference method analytic tools we used in class (finding consistency, stability, well-posedness, etc.) and research their equivalent applications for the finite element method. Using the parabolic Schnakenberg System as an example, I will choose a few analysis tools and describe the difference in application to the FEM and FDM.Here are some of the analysis tools I would like to investigate:

1. FEM well-conditioned evaluation
2. Stability analysis of the θ-method
3. Convergence analysis of the θ-method
4. L_2 and H_1 norms as error indicators

Research Texts

[1] Chung, T. J. *Computational Fluid Dynamics*, second edition. Cambridge University Press, 2010. 1034pp.

[2] Quarteroni, Alfio.]it Numerical Models for Differential Problems, third edition. Springer, 2017. 681pp.