

# STABILITY ANALYSIS OF GENERAL LINEAR NYSTRÖM METHODS

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In this talk we investigate the linear stability properties of the new family of General Linear Nyström methods (GLNs), which is an extension of General Linear Methods to special second order ODEs  $y'' = f(x, y)$ . We present the extension of the classical notions of stability matrix, stability polynomial, stability and periodicity interval, A-stability and P-stability to the family of GLNs. We next focus our interest on the derivation of highly stable GLNs inheriting the same stability properties of highly stable numerical methods existing in literature, i.e. Runge-Kutta-Nyström methods based on indirect collocation on Gauss-Legendre points: this property, in analogy to a similar feature introduced for General Linear Methods solving first order ODEs, is called *Runge-Kutta-Nyström stability*. The stability properties of GLNs with Runge-Kutta-Nyström stability depend on a quadratic polynomial, which is exactly the stability polynomial of the best Runge-Kutta-Nyström assumed as reference. We also provide examples of GLNs with Runge-Kutta-Nyström stability.

## References

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