

Frequency Domain Methods for Continuous and Discrete Volterra Equations

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We consider numerical methods applied to equations of the form

$$(1) \quad y(t) = g(t) + \int k(t-s)\phi(y(t))ds$$

We review recent research which utilises frequency domain methods in the establishment of stability results relating to the above equation and the discretised form

$$(2) \quad y_n = g_n + h \sum w_{n-j}k_{n-j}\phi_j$$

We consider results which, under appropriate conditions, guarantee either asymptotic stability or an oscillatory solution to equations of the above forms and in particular consider these results in the context of applicable numerical methods.

We discuss the potential and limitations of such an approach and give some consideration to the development of an alternative approach which may provide results for a broader range of numerical methods.

We consider numerical examples in support of this discussion.