# Spectral Differencing with a Twist

Manfred Trummer
`mrt@cs.sfu.ca`
Simon Fraser University, Canada

Spectral collocation methods have become very useful in providing highly accurate solutions to differential equations. A straightforward implementation of these methods involves the use of spectral differentiation matrices. To obtain optimal accuracy these matrices must be computed carefully. We demonstrate that naive algorithms for computing these matrices suffer from severe loss of accuracy due to roundoff errors. Several improvements are analyzed and compared. A number of numerical examples are provided, demonstrating significant differences between the sensitivity of the forward problem and inverse problem.