# Exponentially fitted methods in a deferred correction framework

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During this talk, we will look into the combination of deferred correction and exponential fitting, applied to methods for solving boundary value problems.

The idea behind the often used deferred (difference) correction is to promote a low-order method to a higher order by approximating the residual with a second, higher order method. If certain conditions concerning the combination of these methods are satisfied, such a scheme obtains an order of accuracy equal to that of the second method. The well-known code TWPBVP by Cash implements such schemes and is based on mono-implicit Runge-Kutta (MIRK) methods. In the context of this research, the original TWPBVP code was translated from Fortran into Matlab code.

Exponential fitting is a procedure which produces variants of classical methods, aimed to solve problems with oscillating solutions more efficiently. Whenever the solution of a problem falls within the fitting space of such a method, approximations up to machine accuracy can be found. In general however, the free parameter can be tuned to specific frequencies such that one or more orders of accuracy are gained.

In this presentation, we will show how we combined both correction techniques by applying deferred correction schemes to exponentially fitted MIRK methods. We will explore the structure of the error terms en show what can and cannot be done with the free parameter.