# Potentiality of the code HOFiD_bvp in solving different kind of second order bounday value problems

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Many applications in engineering, chemistry, physics and biology give rise to singularly perturbed boundary value problems, also with singularity, of second and high order. These kind of problems can be really stiff by the choice of perturbation parameters extremely strong. The aim of this talk is to show the numerical results obtained by using the Matlab code HOFiD_bvp in solving different kind of problems, starting from singular perturbation problems to singular problems, singular perturbation problems with a discontinuous source term and multipoint second order boundary value problems. The code is based on the application of the HOFiD methods [1, 2], using high order finite difference schemes with upwind to solve this class of BVPs. Code efficiency is guaranteed by implementation of the deferred corrections technique [3] and a mesh selection strategy based on the error equidistribution [4]. For the solution of nonlinear problems improvements on the local convergence of Newton method is considered and a continuation strategy is also available. All theoretical and numerical aspects, such as convergence and error estimation, will be described to emphasize accuracy of the numerical schemes and code potentiality.

## References

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