Mathematical Modelling and Analysis
Abstracts of the 9th International Conference MMA2004, May 29-31, 2004, Jūrmala, Latvia

SOME RAPIDLY CONVERGENT METHODS FOR NONLINEAR FREDHOLM INTEGRAL EQUATION

INDREK KALDO[1] and OTU VAARMANN[2]

[1] *Estonian Business School,*
Lauteri 3, Tallinn, Estonia
[2] *Tallinn University of Technology, Institute of Cybernetics*
Ehitajate 5, 19086, Tallinn, Estonia
E-mail: [1] `indrek.kaldo@ebs.ee`, [2] `vaarmann@edu.ttu.ee`

Many problems in modelling can be reduced to the solution of a nonlinear equation

$$F(x) = 0, \tag{1}$$

where F is a Frechet-differentiable (as many times as necessary) mapping between Banach spaces X and Y. For solving (1) we consider high order iteration methods of the type

$$x_{k+1} = x_k - Q(x_k, A_k^i),\ i \in I,\ I = \{1, \dots, r\},\ r \geq 1,\ k = 0, 1, \dots, \tag{2}$$

where $Q(x, A_k^i)$ is an operator from X into itself and A_k^i, $i \in I$, are some approximations to the inverse(s) occurring in the associated exact method. In particular, the variety (2) contains methods with successive approximation of the inverse operator(s) and those based on the use of iterative methods to obtain a cheap solution of limited accuracy for corresponding linear equation(s) at each iteration step. Convergence properties and computational aspects of the methods under consideration are examined. The solution of nonlinear Fredholm integral equation by means of methods with convergence order $p \geq 2$ are considered and possibilities of organizing parallel computation in iteration process are also briefly discussed.

REFERENCES

[1] O. Vaarmann. On high iterative methods for nonlinear problems. In: *Nonlinear Mathematical Analysis and Applications*, Th M. Raaaias (Ed.), Palm Harbor, FL: Hadronic Press, 1998, 275 – 299.

[2] I. Kaldo and O. Vaarmann. On approximate methods of tangent hyperbolas. *Math. Model. Anal.*, **7** (2), 2002, 253 – 262.