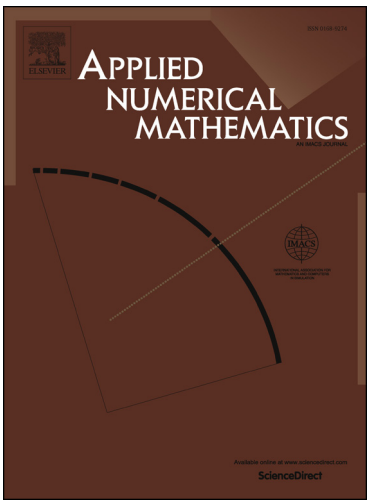
Accepted Manuscript



Construction and implementation of two-step continuous methods for Volterra integral equations

Giovanni Capobianco, Dajana Conte, Beatrice Paternoster

PII: S0168-9274(17)30053-3
DOI: http://dx.doi.org/10.1016/j.apnum.2017.02.008
Reference: APNUM 3170

To appear in: *Applied Numerical Mathematics*

Please cite this article in press as: G. Capobianco et al., Construction and implementation of two-step continuous methods for Volterra integral equations, *Appl. Numer. Math.* (2017), http://dx.doi.org/10.1016/j.apnum.2017.02.008

Construction and implementation of two-step continuous methods for Volterra Integral Equations

Giovanni Capobianco[a], Dajana Conte[b], Beatrice Paternoster[c]

[a]*Dipartimento di Bioscienze e Territorio, Università del Molise, Italy*
[b]*Dipartimento di Matematica, Università degli Studi di Salerno, Via Giovanni Paolo II n.132, I-84084 Fisciano (Sa), Italy*
[c]*Dipartimento di Matematica, Università degli Studi di Salerno, Via Giovanni Paolo II n.132, I-84084 Fisciano (Sa), Italy*

Abstract

It is the purpose of this paper to construct an error estimation for highly stable two-step continuous methods derived in [7], in order to use it in a variable stepsize implementation. New families of two step almost collocation methods are constructed, by using a collocation technique which permits to increase the uniform order of one step collocation methods, without increasing the computational cost and by maintaining good stability properties, thus avoiding the order reduction phenomenon. Numerical experiments confirm the effectiveness of the proposed methods.

Keywords:
collocation, Volterra integral equations, stability, error estimation

1. Introduction

This paper concerns the construction and implementation of both efficient and highly stable numerical methods for Volterra Integral Equations (VIEs) of the form

$$y(t) = g(t) + \int_0^t k(t, \tau, y(\tau))d\tau, \quad t \in [0, T], \tag{1.1}$$

where the *forcing function* $g : \mathbb{R} \to \mathbb{R}^d$ and the *kernel* $k : \mathbb{R}^2 \times \mathbb{R}^d \to \mathbb{R}^d$ are assumed to be sufficiently smooth. A special interest in literature has been

Email addresses: giovanni.capobianco@unimol.it (Giovanni Capobianco), dajconte@unisa.it (Dajana Conte), beapat@unisa.it (Beatrice Paternoster)