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POWER SERIES SOLUTION OF DIFFERENTIAL ALGEBRAIC EQUATION

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Özet

Bu makalede, Lineer diferensiyel cebirsel denklemleri çözmek için kuvvet serisi yöntemi uygulandı. Bu yöntem diferensiyel cebirsel denklemlerin nümerik çözmek için bir keyfi mertebe verir.. Biz bu metodu test etmek için bir örnek verdik ve elde ettiğimiz sonuç ile analitik çözümü karşılaştırdık.
Anahtar kelimeler: Diferensiyel cebirsel denklem, keyfi mertebe, kuvvet serisi.

Abstract

In this paper, we apply the power series method to solve a linear differential algebraic equation. This method gives an arbitrary order for solving differential algebraic equation numerically. We have given an example to test the method and the result of the our method compared the exact solution of the given problem.

Keywords: Differential Algebraic Equation; Arbitrary Order; Power Series.

1. INTRODUCTION

A differential-algebraic equation has the form

$$F(y', y, x) = 0 \tag{1.1}$$

with initial values

$$y(x_0) = y_0, \quad y'(x_0) = y_1,$$

where F and y is a vector function for which we assumed sufficient differentiability[3,4,6], and the initial values to be consistent, i.e.

$$F(y_0, y_0', x_0) = 0.$$

The solutions of (1.1) can be assumed that

$$y = y_0 + y_1 x + e x^2,$$

where e is a vector function which is the same size as y_0 and y_0'. Substitute (1.3) into (1.1) and neglect higher order term, we have the linear equation of e in the form

$$Ae = B \tag{1.4}$$

where A and B are constant matrixes. Solving equation (1.4), the coefficients of x^2 in (1.3) can be determined. Repeating above procedure for higher order terms, we can get the arbitrary order power series of the solutions for (1.1) and we have numerical solution of differential algebraic equation in (1.1).

2. POWER SERIES FOR DIFFERENTIAL ALGEBRAIC EQUATIONS

We define another type power series in the form

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