Yıldız Teknik Üniversitesi Elektrik-Elektronik Fakültesi Bilgisayar Mühendisliği Bölümü

BLM2642

Bilgisayar Mühendisliği İçin Diferansiyel Denklemler

Gr:2

Ödev 2

İsim: Konuralp BOL

No:22011618

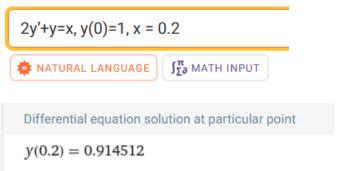
E-posta:konuralp.bol@std.yildiz.edu.tr

KONU: 1. mertebeden sabit katsayılı n terimli doğrusal adi diferansiyel denkleminin Runge Kutta-4 yöntemiyle sayısal çözümünü C dilinde kodlayınız.

Denklemi saklamak için her terimin katsayısı ve üssünü tutan bir struct yapisi olusturdum. Bu structtan oluşan array ile denklemi tuttum. Runge Kutta 4'ün formülünü koda döktüm ve aşağıdaki örnekler ile test ettim. İlk 3 örneği bilindik olması için atozmath.com'dan aldım. 4. Örneği ise kendim verdim. Gerçek değerleri wolframalpha ile buldum.

Örnek 1:

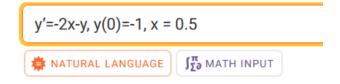
Find y(0.2) for y'=(x-y)/2, x0=0,y0=1, with step length 0.1



Mutlak Hata:0

Örnek 2

Find y(0.5) for y'=-2x-y, x0=0, y0=-1, with step length 0.1



Differential equation solution at particular point

```
y(0.5) = -0.819592
```

```
Ay' + By = f(t)
A degerini giriniz: 1
B degerini giriniz: 1
Kac terim olacagini(n) giriniz:1
1.terimin katsayisini giriniz: -2
1.terimin derecesini giriniz: 1
Baslangic t degeri: 0
Baslangic y degeri: -1
Hedeflenen deger: 0.5
Adim buyuklugu: 0.1
y(0.100000):-0.914513 k1:0.100000 k2:0.085000 k3:0.085750 k4:0.071425
y(0.200000):-0.856193 k1:0.071451 k2:0.057879 k3:0.058557 k4:0.045596
y(0.300000):-0.822455 k1:0.045619 k2:0.033338 k3:0.033952 k4:0.022224
y(0.400000):-0.810961 k1:0.022246 k2:0.011133 k3:0.011689 k4:0.001077
y(0.500000):-0.819593 k1:0.001096 k2:-0.008959 k3:-0.008456 k4:-0.018058
```

Mutlak Hata:0.000001

Örnek 3

Find y(0.2) for y'=-y, x0=0, y0=1, with step length 0.1

```
y'=-y, y(0)=1, x=0.2
                                                                                           compute inpu
   🛊 NATURAL LANGUAGE │ 🔀 MATH INPUT
                                                  ■ EXTENDED KEYBOARD 

EXAMPLES 

UPLOAD 

UPLOAD
    Input
    {y'(x) = -y(x), y(0) = 1, x = 0.2}
    Separable equation
    ODE classification
    first-order linear ordinary differential equation
    Alternate form
    {y'(x) + y(x) = 0, y(0) = 1, x = 0.2}
    Differential equation solution
                                                            Approximate form
                                                                           Step-by-step solution
    y(x) = e^{-x}
    Differential equation solution at particular point
    y(0.2) = 0.818731
Ay' + By = f(t)
A degerini giriniz: 1
B degerini giriniz: 1
Kac terim olacagini(n) giriniz:0
Baslangic t degeri: 0
Baslangic y degeri: 1
Hedeflenen deger: 0.2
Adim buyuklugu: 0.1
y(0.100000):0.904837 k1:-0.100000 k2:-0.095000 k3:-0.095250 k4:-0.090475
y(0.200000):0.818731 k1:-0.090484 k2:-0.085960 k3:-0.086186 k4:-0.081865
```

Mutlak Hata: 0

Örnek 4

Given y'=-10x2-3y,y(0)=-1,h=0.1,y(0.2)=?

```
y'=-10x2-3y, y(0)=-1, x=0.2
                                              ■ EXTENDED KEYBOARD 

EXAMPLES 

UPLOAD 

compute input
    ‡ NATURAL LANGUAGE ∫ ∫ MATH INPUT
     {y'(x) = -10 x^2 - 3 y(x), y(0) = -1, x = 0.2}
     ODE classification
     first-order linear ordinary differential equation
     \{10x^2 + y'(x) + 3y(x) = 0, y(0) = -1, x = 0.2\}
                                                                     Approximate form
     y(x) = \frac{1}{27} \left( -90 x^2 + 60 x - 7 e^{-3 x} - 20 \right)
     Differential equation solution at particular point
     y(0.2) = -0.571914
Ay' + By = f(t)
A degerini giriniz: 1
B degerini giriniz: 3
Kac terim olacagini(n) giriniz:1
1.terimin katsayisini giriniz: -10
1.terimin derecesini giriniz: 2
Baslangic t degeri: 0
Baslangic y degeri: -1
Hedeflenen deger: 0.2
Adim buyuklugu: 0.1
y(0.100000):-0.743940 k1:0.300000 k2:0.252500 k3:0.259625 k4:0.212112
y(0.200000):-0.571954 k1:0.213182 k2:0.168705 k3:0.175376 k4:0.130569
Process exited after 47.55 seconds with return value 0
Press any key to continue . . .
```

Mutlak Hata:0