**princ.f90**

!

! programa de ajuste por minimos quadrados

!

use msflib ! biblioteca que contem o comando systemqq

logical chamada

!

parameter(nmax=25)

dimension x(0:nmax),fx(0:nmax),alfa(0:nmax,0:nmax),b(0:nmax)

dimension a(nmax+1,nmax+1),aux(nmax+1)

!

! arquivo de entrada com Nr pontos dados "n" e os valores "x\_i" e "fx(x\_i)"

!

open (9,file='inptab.txt')

!

! arquivo de saída com a curva ajustada

!

open (3,file='out-ajust.txt')

!

!\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

! Leitura do grau do polinomio de ajuste

!

!\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

!

write(\*,\*)'Entre com o grau do polinomio de ajuste:'

read(\*,\*)m

!

!\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

!

!

! ler Nr de pontos dados "n" e os pontos dados a interpolar

!

read(9,\*)n

do i=0,n

read(9,\*) x(i),fx(i)

enddo

!

! Nr de pontos desejado para a curva ajustada

!

write(\*,\*)'Entre com o Nr de pontos desejado para a curva ajustada:'

read(\*,\*)naj

!

! calcular os coeficientes "alfa"

!

ialfa=0

do i=0,m

do j=ialfa,m

sum=0.

do k=0,n

gl=g(i,x(k))

gr=g(j,x(k))

sum=sum+gl\*gr

enddo

if(i.ne.j) then

alfa(i,j)=sum

alfa(j,i)=sum

else

alfa(i,j)=sum

endif

enddo

ialfa=ialfa+1

enddo

!

do i=0,m

sum=0.

do k=0,n

gr=g(i,x(k))

sum=sum+fx(k)\*gr

enddo

b(i)=sum

enddo

!

do i=0,m

write(\*,\*)'b(',i,')=',b(i)

aux(i+1)=b(i)

write(\*,\*)'aux(',i+1,')=',aux(i+1)

do j=0,m

write(\*,\*)'alfa(',i,',',j,')= ',alfa(i,j)

a(j+1,i+1)=alfa(i,j)

write(\*,\*)'a(',i+1,',',j+1,')= ',a(j+1,i+1)

enddo

enddo

!

! obtain the polynomial coefficients

!

call ludcmp(a,m+1,nmax+1,indx,d)

call lubksb(a,m+1,nmax+1,indx,aux)

!

do i=0,m

write(\*,\*)'aux(',i+1,')=',aux(i+1)

enddo

!

dx=(x(n)-x(0))/naj

xp=x(0)

do i=1,naj+1

fp=0.

do j=0,m

fp=fp+aux(j+1)\*g(j,xp)

enddo

write(3,\*)xp,fp

xp=xp+dx

enddo

close(3)

chamada = systemqq('notepad out-ajust.txt') ! listagem dos dados

chamada = systemqq('wgnuplot dados.gnu') ! gráfico

stop

end

!\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

function g(i,x)

aux=x\*\*i

g=aux

return

end

!----------------------------------

**lubksb.f90**

SUBROUTINE lubksb(a,n,np,indx,b)

! implicit real \*8 (a-h,o-z)

dimension indx(np),a(np,np),b(np)

ii=0

do 12 i=1,n

ll=indx(i)

sum=b(ll)

b(ll)=b(i)

if (ii.ne.0)then

do 11 j=ii,i-1

sum=sum-a(i,j)\*b(j)

11 continue

else if (sum.ne.0.) then

ii=i

endif

b(i)=sum

12 continue

do 14 i=n,1,-1

sum=b(i)

do 13 j=i+1,n

sum=sum-a(i,j)\*b(j)

13 continue

b(i)=sum/a(i,i)

14 continue

return

END

!------------------------------------------------------------------

**ludcmp.f90**

SUBROUTINE ludcmp(a,n,np,indx,d)

! implicit real \*8 (a-h,o-z)

PARAMETER (NMAX=10,TINY=1.0e-20)

dimension indx(np),a(np,np),vv(NMAX)

d=1.

do 12 i=1,n

aamax=0.

do 11 j=1,n

if (abs(a(i,j)).gt.aamax) aamax=abs(a(i,j))

11 continue

if (aamax.eq.0.) then

! do ja=1,n

! do jb=1,n

! write(\*,\*)'a(',ja,',',jb,')=',a(ja,jb)

! enddo

! enddo

pause 'singular matrix in ludcmp'

endif

vv(i)=1./aamax

12 continue

do 19 j=1,n

do 14 i=1,j-1

sum=a(i,j)

do 13 k=1,i-1

sum=sum-a(i,k)\*a(k,j)

13 continue

a(i,j)=sum

14 continue

aamax=0.

do 16 i=j,n

sum=a(i,j)

do 15 k=1,j-1

sum=sum-a(i,k)\*a(k,j)

15 continue

a(i,j)=sum

dum=vv(i)\*abs(sum)

if (dum.ge.aamax) then

imax=i

aamax=dum

endif

16 continue

if (j.ne.imax)then

do 17 k=1,n

dum=a(imax,k)

a(imax,k)=a(j,k)

a(j,k)=dum

17 continue

d=-d

vv(imax)=vv(j)

endif

indx(j)=imax

if(a(j,j).eq.0.)a(j,j)=TINY

if(j.ne.n)then

dum=1./a(j,j)

do 18 i=j+1,n

a(i,j)=a(i,j)\*dum

18 continue

endif

19 continue

return

END

!-----------------------------------------------------------------

**inptab.txt**

5

0. 0.

1. 50.

2. 40.

3. 0.

4. 100.

5. 20.

**dados.gnu**

set data style linespoints

set grid

set xlabel 'Tempo (min)'

set ylabel 'p\_m(x) para velocidade'

set title 'Percurso automovel'

plot 'inptab.txt','out-ajust.txt'

pause -1

**inptab-FBR.txt**

9

0. 59.

1. 60.

2. 86.

5. 185.

6. 223.

7. 212.

8. 321.

13. 353.

14. 391.

15. 420.