**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.