**Name : Niraj Khankari Sec.: T.Y.B.Tech (R&A) Roll no.: 26**

**Artificial Bee Colony Algorithm \_ Robot Controller Design**

#include<stdlib.h>

#include<stdio.h>

#include<math.h>

void main()

{

int i,j,k,n,ne,no,Nint[10][30],m,q;

float R[20],R1[12][7],R2[12][7],Nfloat[7][20];

float f[7][20],fi[7][20],sumfi[20],p[7][20],x1[7][20],x2[7][20];

float x1max,x1min,x2max,x2min,s1,s2,min[7][20],min1[20],minf[20];

float x1new[12][7][20],x2new[12][7][20],fnew[12][7][20],p1[7][20];

float z[7][20],con1[7][20],con2[7][20],pc1,x3[7][20];

float x3new[12][7][20],znew[12][7][20],con1new[12][7][20];

float R3[12][7],R4[12][7],s3,s4,x3max,x3min,x4max,x4min,x4[7][20];

float x4new[12][7][20];

printf("\nEnter the No.of iterations:");

scanf("%d",&n);

printf("\nEnter Number of Employed Bees:");

scanf("%d",&ne);

printf("\nEnter Number of Onlookers Bees:");

scanf("%d",&no);

x1min=0.5; x2min=0;

x1max=5; x2max=20;

s1=(x1max-x1min)/6; s2=(x2max-x2min)/6;

x1[1][0]=3; x2[1][0]=5;

x1[2][0]=4; x2[2][0]=2;

x1[3][0]=5; x2[3][0]=1;

x1[4][0]=3; x2[4][0]=6;

x1[5][0]=1; x2[5][0]=5;

for(k=0;k<=n-1;k++)

{

minf[k]=999999;

for(j=1;j<=ne;j++)

{

z[j][k]=abs(20-(20\*x1[j][k]\*(1-x2[j][k]\*exp(-x2[j][k])-exp(-x2[j][k]))))+x2[j][k];

f[j][k]=z[j][k];

//printf("\n Function value=%f",f[j][k]);

}

for(j=1;j<=ne;j++)

{

fi[j][k]=1/f[j][k]; }

for(j=1;j<=ne;j++)

{

fi[0][k]=0;

fi[j][k]=fi[j][k]+fi[j-1][k];

}

sumfi[k]=fi[ne][k];

for(j=1;j<=ne;j++)

{

p[j][k]=(sumfi[k]\*f[j][k]);

p1[j][k]=1/p[j][k];

//printf("\n Probability=%f",p1[j][k]);

}

for(j=1;j<=ne;j++)

{

Nfloat[j][k]=p1[j][k]\*no;

Nint[j][k]=Nfloat[j][k];

//printf("\nNumber of Onlookers bees assigned to source %d=%d",j,Nint[j][k]);

}

for(j=1;j<=ne;j++)

{

for(i=1;i<=Nint[j][k];i++)

{

R1[i][j]=((float)(rand() % 100)/100);

R2[i][j]=((float)(rand() % 100)/100);

// printf("R1[%d]=%f and R2[%d]=%f",k,k,R1[k],R2[k]);

x1new[i][j][k]=x1[j][k]+(s1\*(R1[i][j]-0.5));

x2new[i][j][k]=x2[j][k]+(s2\*(R2[i][j]-0.5));

if(x1new[i][j][k]>x1max) x1new[i][j][k]=x1max; else x1new[i][j][k]=x1new[i][j][k];

if(x2new[i][j][k]>x2max) x2new[i][j][k]=x2max; else x2new[i][j][k]=x2new[i][j][k];

if(x1new[i][j][k]<x1min) x1new[i][j][k]=x1min; else x1new[i][j][k]=x1new[i][j][k];

if(x2new[i][j][k]<x2min) x2new[i][j][k]=x2min; else x2new[i][j][k]=x2new[i][j][k];

znew[i][j][k]=abs(20-((20\*x1new[i][j][k])\*(1-x2new[i][j][k]\*exp(-x2new[i][j][k])-exp(-x2new[i][j][k]))))+x2new[i][j][k];

fnew[i][j][k]=znew[i][j][k];

printf("\nX1new %d,X2new %d for bee %d=%f, %f",i,i,j,x1new[i][j][k],x2new[i][j][k]);

printf("\nFnew %d for bee %d=%f",i,j,fnew[i][j][k]);

}

}

for(j=1;j<=ne;j++)

{

min[j][k]=999999;

for(i=1;i<=Nint[j][k];i++)

{

if(fnew[i][j][k]<min[j][k])

{

min[j][k]=fnew[i][j][k];

m=i;

}

}

if(min[j][k]<f[j][k])

{

x1[j][k+1]=x1new[m][j][k];

x2[j][k+1]=x2new[m][j][k];

}

else

{

x1[j][k+1]=x1[j][k];

x2[j][k+1]=x2[j][k];

}

}

min1[k]=999999;

for(j=1;j<=ne;j++)

{

if(min[j][k]<min1[k])

{

min1[k]=min[j][k];

q=j;

}

}/\* previous j loop ends \*/

min1[-1]=999999;

if(min1[k]<min1[k-1]) min1[k]=min1[k];

else min1[k]=min1[k-1];

printf("\nMin.function value at the end of iteration %d=%f",k,min1[k]);

printf("\nBest solution found at the end of iteration %d=%f,%f,",k,x1[q][k+1],x2[q][k+1]);

} /\* k loop ends here \*/

}

**Output :**

Enter the No.of iterations:50

Enter Number of Employed Bees:5

Enter Number of Onlookers Bees:11

**First Iteration**

X1new 1,X2new 1 for bee 3=5.000000, 2.200000

Fnew 1 for bee 3=46.200001

X1new 2,X2new 2 for bee 3=5.000000, 0.000000

Fnew 2 for bee 3=20.000000

X1new 3,X2new 3 for bee 3=5.000000, 0.500000

Fnew 3 for bee 3=10.500000

X1new 1,X2new 1 for bee 5=1.270000, 6.400000

Fnew 1 for bee 5=11.400000

X1new 2,X2new 2 for bee 5=0.992500, 4.033333

Fnew 2 for bee 5=5.033333

X1new 3,X2new 3 for bee 5=1.090000, 4.233334

Fnew 3 for bee 5=4.233334

X1new 4,X2new 4 for bee 5=1.300000, 5.300000

Fnew 4 for bee 5=10.299999

X1new 5,X2new 5 for bee 5=1.097500, 4.200000

Fnew 5 for bee 5=4.200000

Min.function value at the end of iteration 0=4.200000

Best solution found at the end of iteration 0=1.097500,4.200000,

**Last Iteration**

Min.function value at the end of iteration 49=0.833333

Best solution found at the end of iteration 49=1.757500,1.866667,