clc;

clear;

close all;

%% Problem Definition

data = xlsread('infile');

X = data;

k = 2;

CostFunction=@(m) ClusteringCost(m, X); % Cost Function

VarSize=[k size(X,2)]; % Decision Variables Matrix Size

nVar=prod(VarSize); % Number of Decision Variables

VarMin= repmat(min(X),k,1); % Lower Bound of Variables

VarMax= repmat(max(X),k,1); % Upper Bound of Variables

%% DE Parameters

MaxIt=200; % Maximum Number of Iterations

nPop=70; % Population Size

beta\_min=0.2; % Lower Bound of Scaling Factor

beta\_max=0.8; % Upper Bound of Scaling Factor

pCR=0.2; % Crossover Probability

%% Initialization

empty\_individual.Position=[];

empty\_individual.Cost=[];

empty\_individual.Out=[];

BestSol.Cost=inf;

pop=repmat(empty\_individual,nPop,1);

for i=1:nPop

pop(i).Position=unifrnd(VarMin,VarMax,VarSize);

[pop(i).Cost, pop(i).Out]=CostFunction(pop(i).Position);

if pop(i).Cost<BestSol.Cost

BestSol=pop(i);

end

end

BestCost=zeros(MaxIt,1);

%% DE Main Loop

for it=1:MaxIt

for i=1:nPop

x=pop(i).Position;

A=randperm(nPop);

A(A==i)=[];

a=A(1);

b=A(2);

c=A(3);

% Mutation

%beta=unifrnd(beta\_min,beta\_max);

beta=unifrnd(beta\_min,beta\_max,VarSize);

y=pop(a).Position+beta.\*(pop(b).Position-pop(c).Position);

y=max(y,VarMin);

y=min(y,VarMax);

% Crossover

z=zeros(size(x));

j0=randi([1 numel(x)]);

for j=1:numel(x)

if j==j0 || rand<=pCR

z(j)=y(j);

else

z(j)=x(j);

end

end

NewSol.Position=z;

[NewSol.Cost, NewSol.Out]=CostFunction(NewSol.Position);

if NewSol.Cost<pop(i).Cost

pop(i)=NewSol;

if pop(i).Cost<BestSol.Cost

BestSol=pop(i);

end

end

end

% Update Best Cost

BestCost(it)=BestSol.Cost;

% Show Iteration Information

disp(['Iteration ' num2str(it) ': Best Cost = ' num2str(BestCost(it))]);

% Plot Solution

figure(1);

PlotSolution(X, BestSol);

pause(0.01);

end

%% Show Results

figure;

plot(BestCost,'LineWidth',2);

xlabel('Iteration');

ylabel('Best Cost');