clc;

clear all;

c1 = 1.49445;

c2 = 1.49445;%速度学习因子

max\_genxin = 100;%最大迭代次数

size\_zhongqun = 20;%种群规模

max\_geti = 5;%个体（自变量取值）最大值（位置）

min\_geti = -5;

v\_max = 1;%速度最大值

v\_min = -1;%速度最小值

%%种群初始化

var\_num = 2;%适应度函数自变量个数

zhongqun = 5\*rand(size\_zhongqun,var\_num);%初始化粒子

v\_zhongqun = rand(size\_zhongqun,var\_num);%初始化粒子速度

for i = 1:size\_zhongqun

fitness(i) = fun\_shiyingdu(zhongqun(i,:)); %计算适应度值

end

%%寻找初始极值

[bestfitness\_value, bestfitness\_weizhi] = min(fitness);

jizhi\_zhongqun = zhongqun(bestfitness\_weizhi,:);%群体极值位置

jizhi\_geti = zhongqun;%个体极值位置

fitnessbest\_geti = fitness;%个体极值适应度值

fitnessbest\_group = bestfitness\_value;%群体极值适应度值

%%迭代寻优

for i = 1:max\_genxin

for j = 1:size\_zhongqun

%速度更新

v\_zhongqun(j,:) = v\_zhongqun(j,:)+c1\*rand\*(jizhi\_geti(j,:)-zhongqun(j,:))+c2\*rand\*(jizhi\_zhongqun-zhongqun(j,:));

v\_zhongqun(j,v\_zhongqun(j,:)>v\_max) = v\_max;

v\_zhongqun(j,v\_zhongqun(j,:)<v\_min) = v\_min;

%粒子更新

zhongqun(j,:) = zhongqun(j,:)+0.5\*v\_zhongqun(j,:);

zhongqun(j,zhongqun(j,:) >max\_geti) = max\_geti;

zhongqun(j,zhongqun(j,:)< min\_geti) = min\_geti;

%粒子适应度值

fitness(j) = fun\_shiyingdu(zhongqun(j,:));

end

%个体极值和群体极值更新

for j = 1:size\_zhongqun

%个体极值更新

if fitness(j) < fitnessbest\_geti(j)

jizhi\_geti(j,:) = zhongqun(j,:);

fitnessbest\_geti(j) = fitness(j);

end

%群体极值更新

if fitness(j) < fitnessbest\_group

jizhi\_zhongqun = zhongqun(j,:);

fitnessbest\_group = fitness(j);

end

end

%没代最优值记录到yy数组

yy(i) = fitnessbest\_group;

end

%%画出每代最优个体适应度值

plot(yy);

title('最优个体适应度值','fontsize',12);

xlabel('进化次数');

ylabel('适应度值');

%需要在同一个工作区存以下函数文件： fun\_shiyingdu.m

function y = fun\_shiyingdu(x) %计算适应度值的函数

% x input 粒子的初始位置

% y output

y = -20\*exp(-0.2\*sqrt((x(1)^2+x(2)^2)/2))-exp((cos(2\*pi\*x(1))+cos(2\*pi\*x(2)))/2)+20+exp(1);