遗传算法求解TSP问题

史峰等，《MATLAB智能算法30个案例分析》，北京航空航天大学出版社，2011年1月

Contents

工具箱的安装

str=[matlabroot,'\mcr\toolbox\gatbx']; addpath(str) 或者手工添加到matlab工作路径 “设置路径”

```
clear
clc
close all
X =[16.47,96.10
    16.47,94.44
    20.09,92.54
    22.39,93.37
    25.23,97.24
    22.00,96.05
    20.47,97.02
    17.20,96.29
    16.30,97.38
    14.05,98.12
    16.53,97.38
    21.52,95.59
    19.41,97.13
    20.09,92.55];%个城市坐标位置,可以换成load CityPosition1.mat
NIND=100;        %种群大小
MAXGEN=200;
Pc=0.9;          %交叉概率
Pm=0.05;         %变异概率
GGAP=0.9;       %代沟(Generation gap)
D=Distanse(X);   %生成距离矩阵
N=size(D,1);     %(34*34)
```

初始化种群

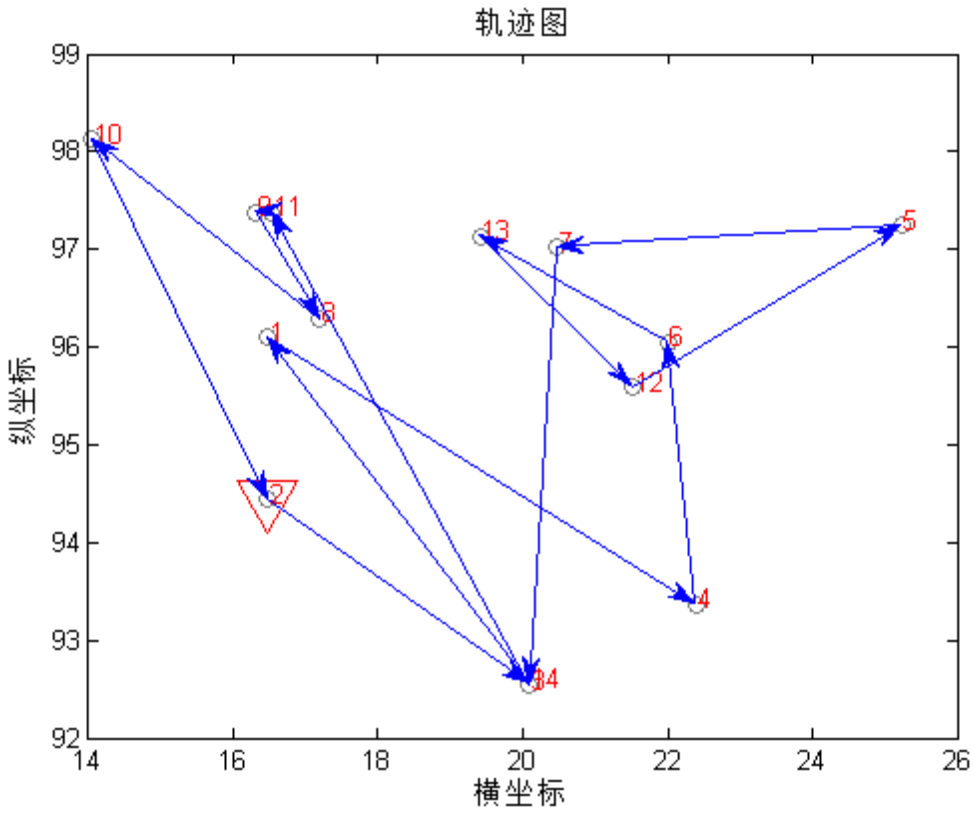
```
Chrom=InitPop(NIND,N);
```

在二维图上画出所有坐标点

figure plot(X(:,1),X(:,2),'o');

画出随机解的路线图

```
DrawPath(Chrom(1,:),X)
pause(0.0001)
```



输出随机解的路线和总距离

```
disp('初始种群中的一个随机值:')
OutputPath(Chrom(1,:));
Rlength=PathLength(D,Chrom(1,:));
disp(['总距离：',num2str(Rlength)]);
disp('~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~')
```

```
初始种群中的一个随机值:
2—>14—>1—>4—>6—>13—>12—>5—>7—>3—>11—>9—>8—>10—>2
总距离：52.8204
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
```

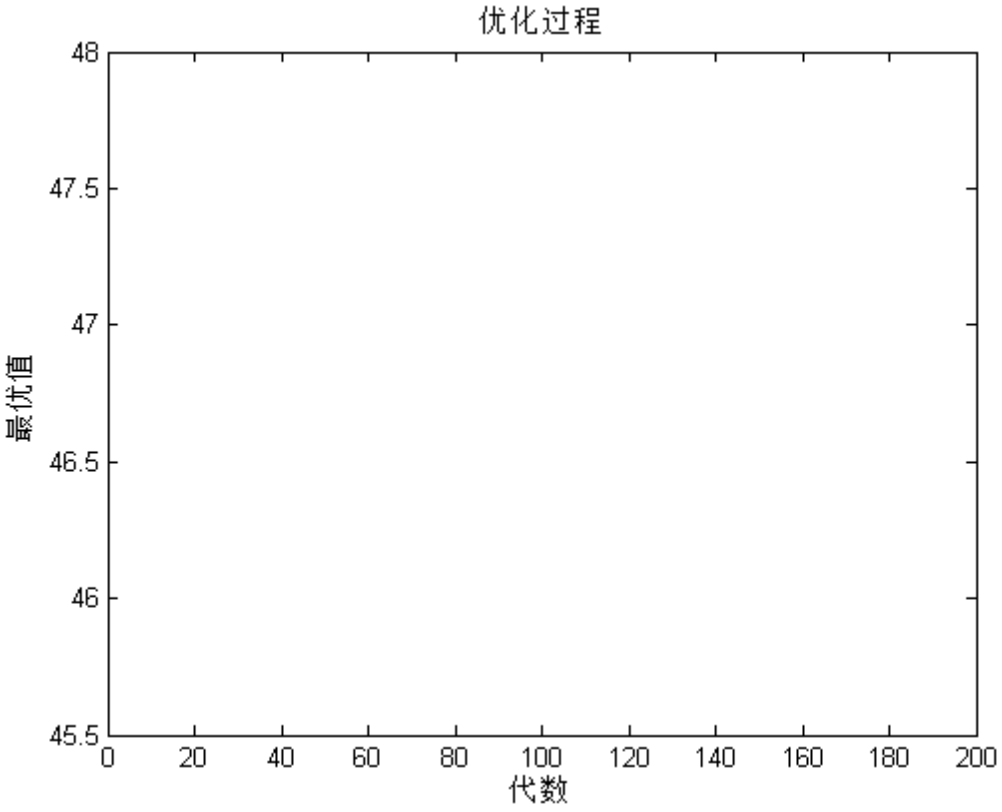
优化

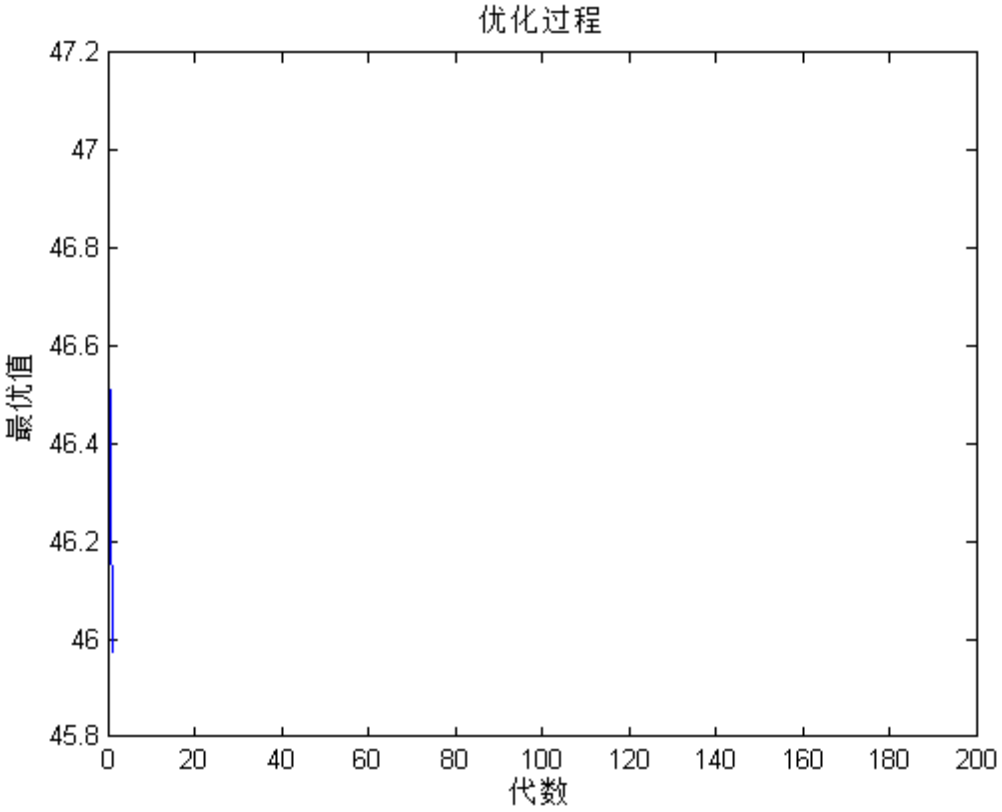
```
gen=0;
figure;
hold on;box on
xlim([0,MAXGEN])
title('优化过程')
xlabel('代数')
ylabel('最优值')
ObjV=PathLength(D,Chrom);  %计算路线长度
```

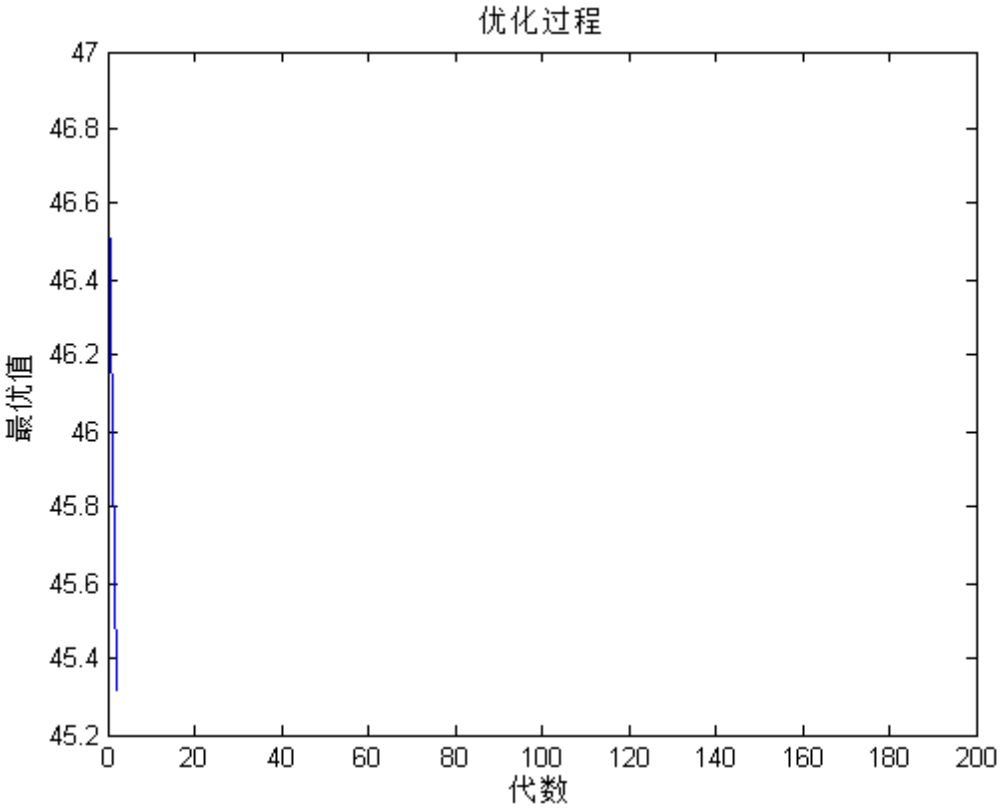
```
preObjV=min(ObjV);
while gen<MAXGEN
```

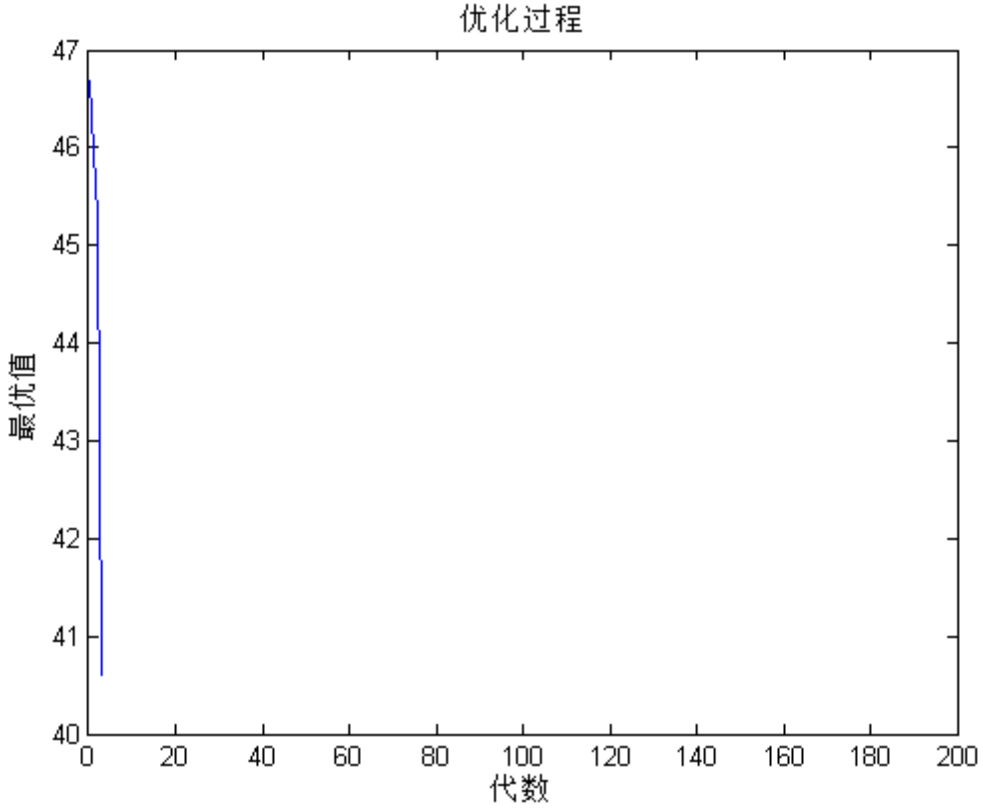
计算适应度

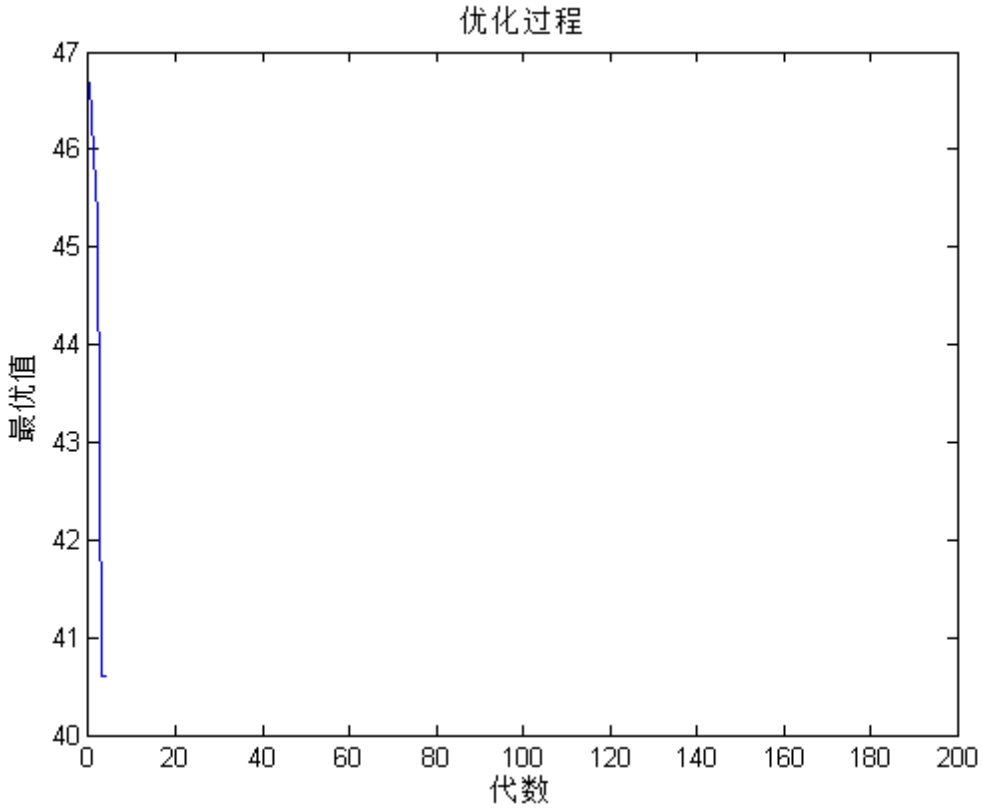
```
    ObjV=PathLength(D,Chrom);  %计算路线长度
    % fprintf('%d   %1.10f\n',gen,min(ObjV))
    line([gen-1,gen],[preObjV,min(ObjV)]);pause(0.0001)
    preObjV=min(ObjV);
    FitnV=Fitness(ObjV);
```

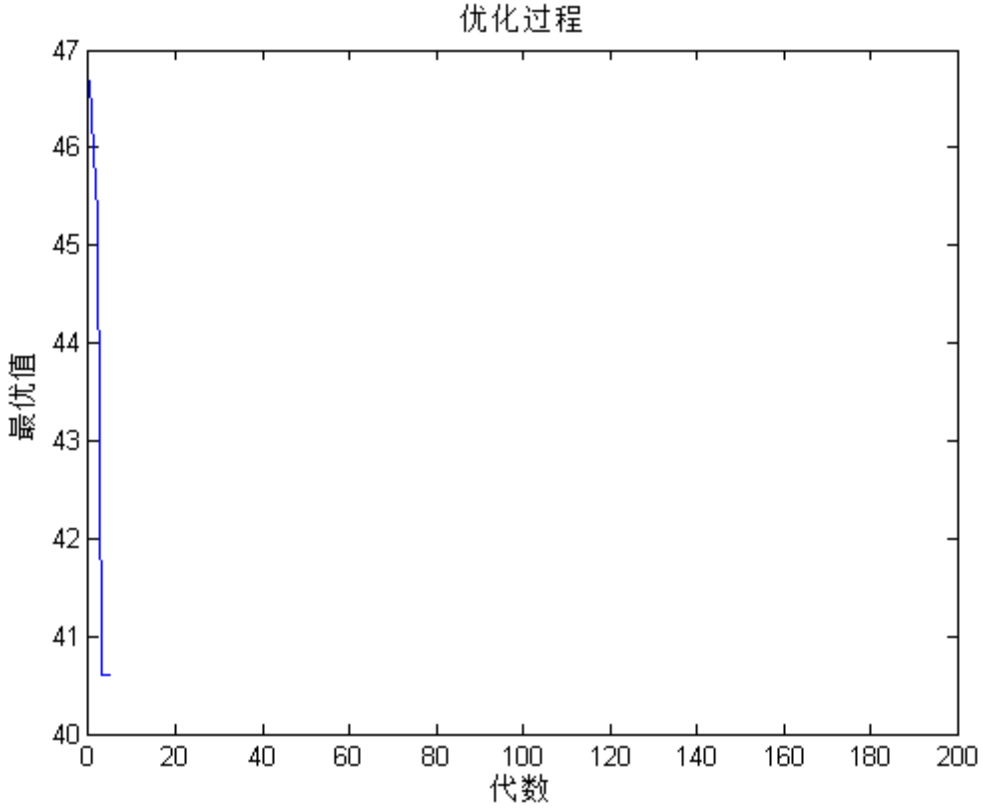

优化过程
48
47.5
47
46.5
46
45.5
最优值
0
20
40
60
80
100
120
140
160
180
200
代数

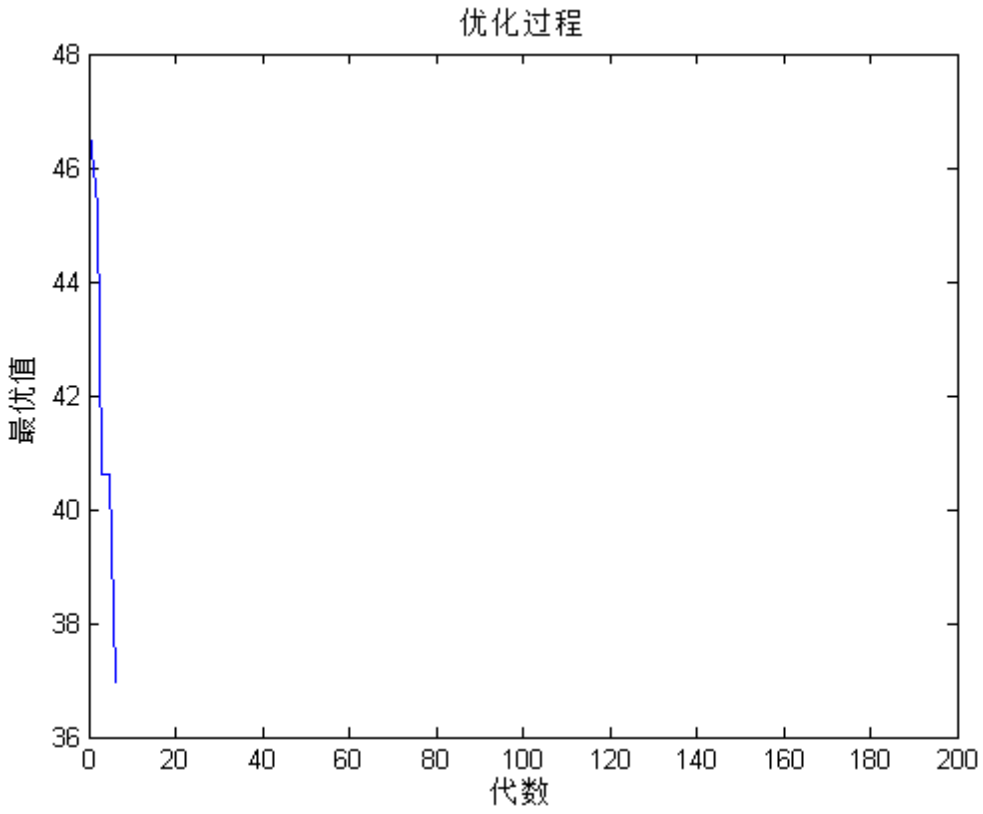

优化过程
47.2
47
46.8
46.6
46.4
46.2
46
45.8
最优值
0
20
40
60
80
100
120
140
160
180
200
代数

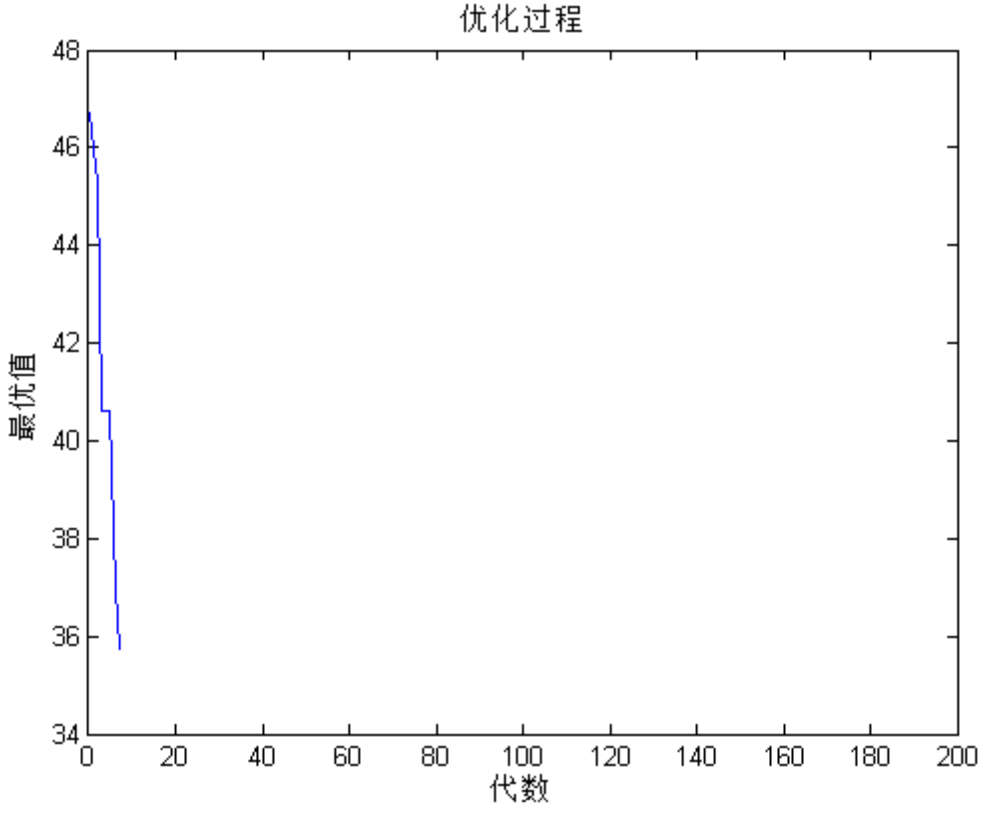

优化过程
47
46.8
46.6
46.4
46.2
46
45.8
45.6
45.4
45.2
最优值
0
20
40
60
80
100
120
140
160
180
200
代数

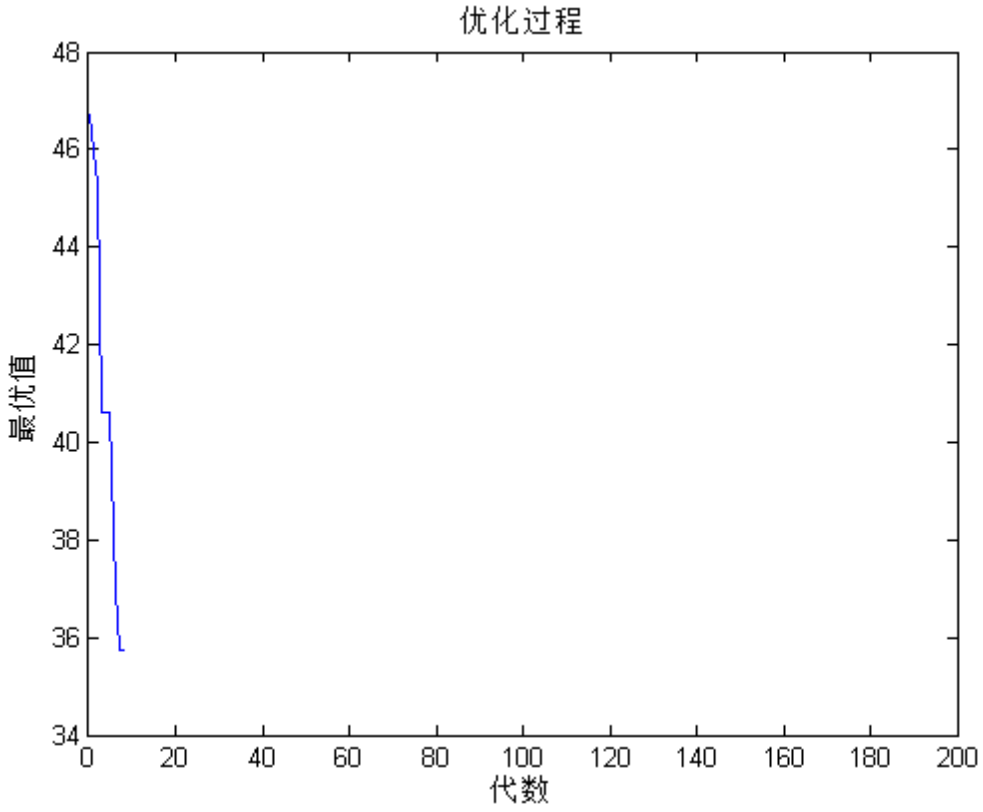

优化过程
47
46
45
44
43
42
41
40
最优值
0
20
40
60
80
100
120
140
160
180
200
代数

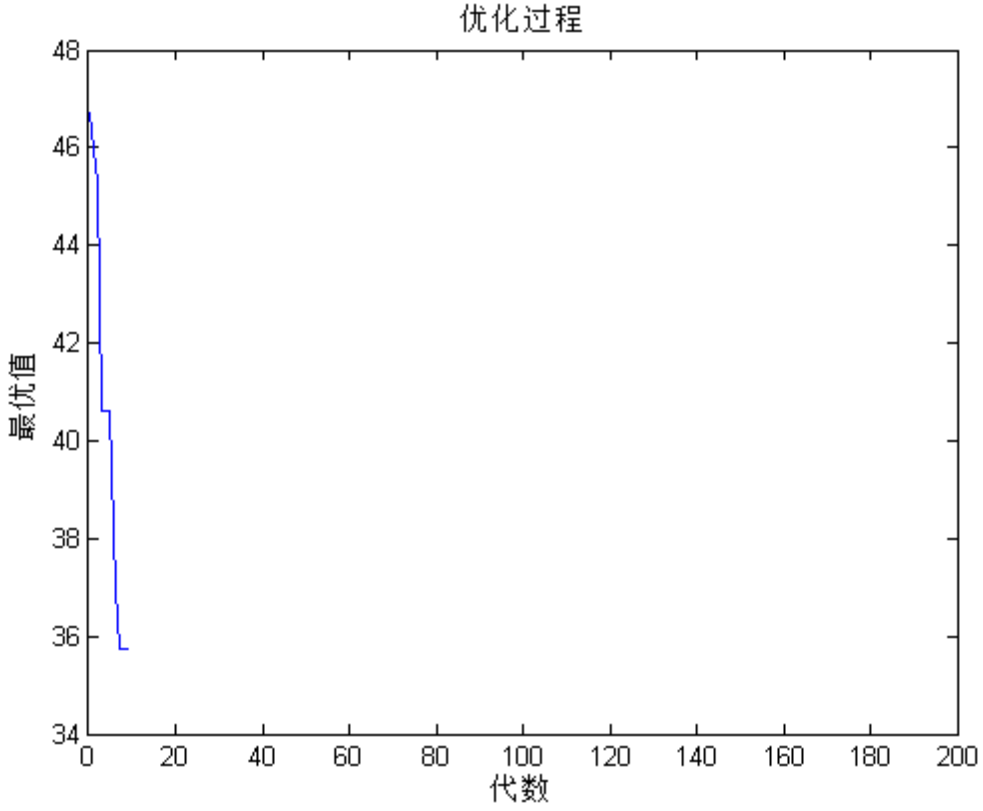

优化过程
47
46
45
44
43
42
41
40
最优值
0
20
40
60
80
100
120
140
160
180
200
代数

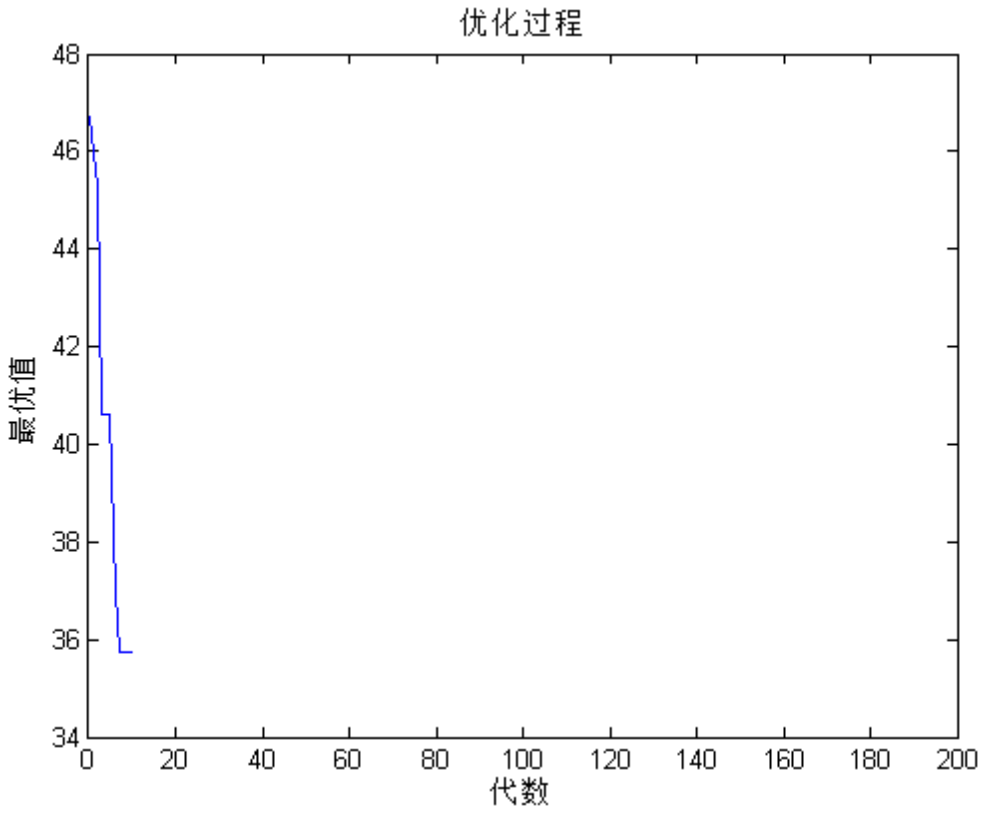

优化过程
47
46
45
44
43
42
41
40
最优值
0
20
40
60
80
100
120
140
160
180
200
代数

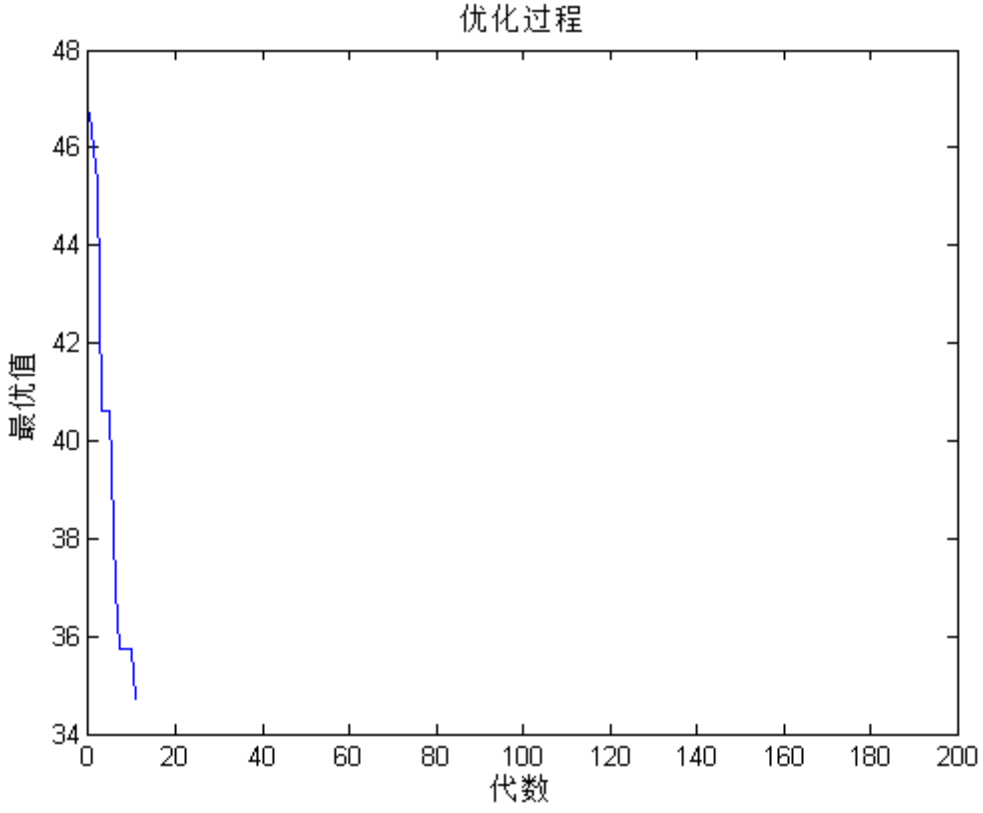

优化过程
48
46
44
42
40
38
36
最优值
0
20
40
60
80
100
120
140
160
180
200
代数

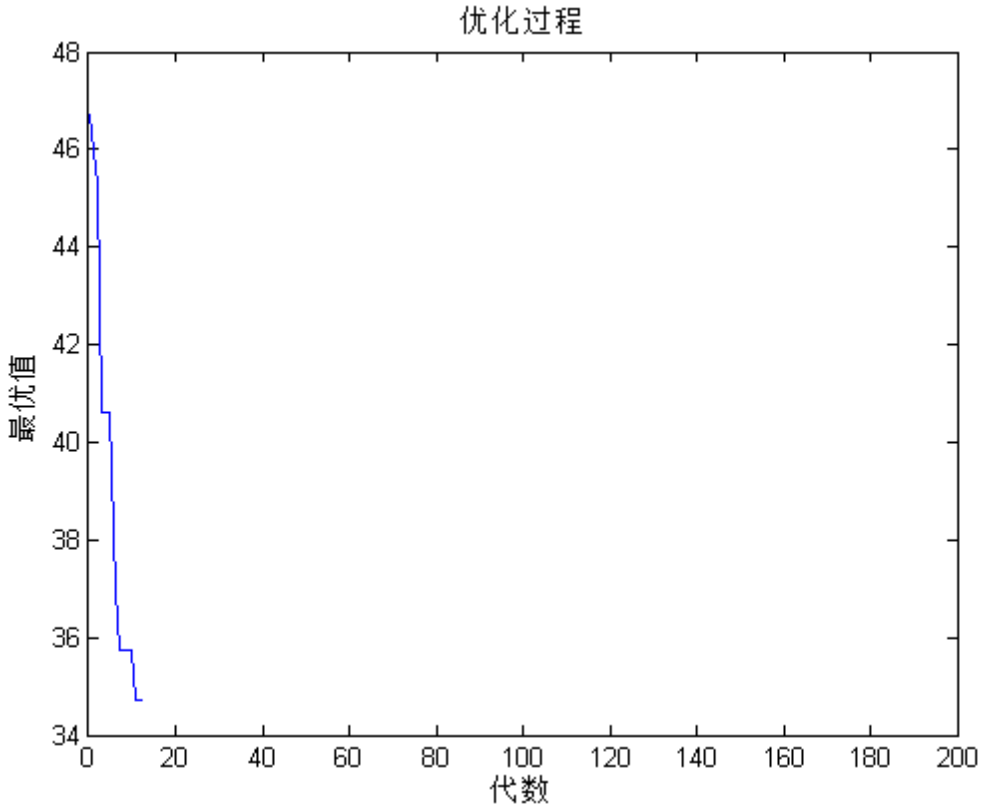

优化过程
48
46
44
42
40
38
36
34
最优值
0
20
40
60
80
100
120
140
160
180
200
代数

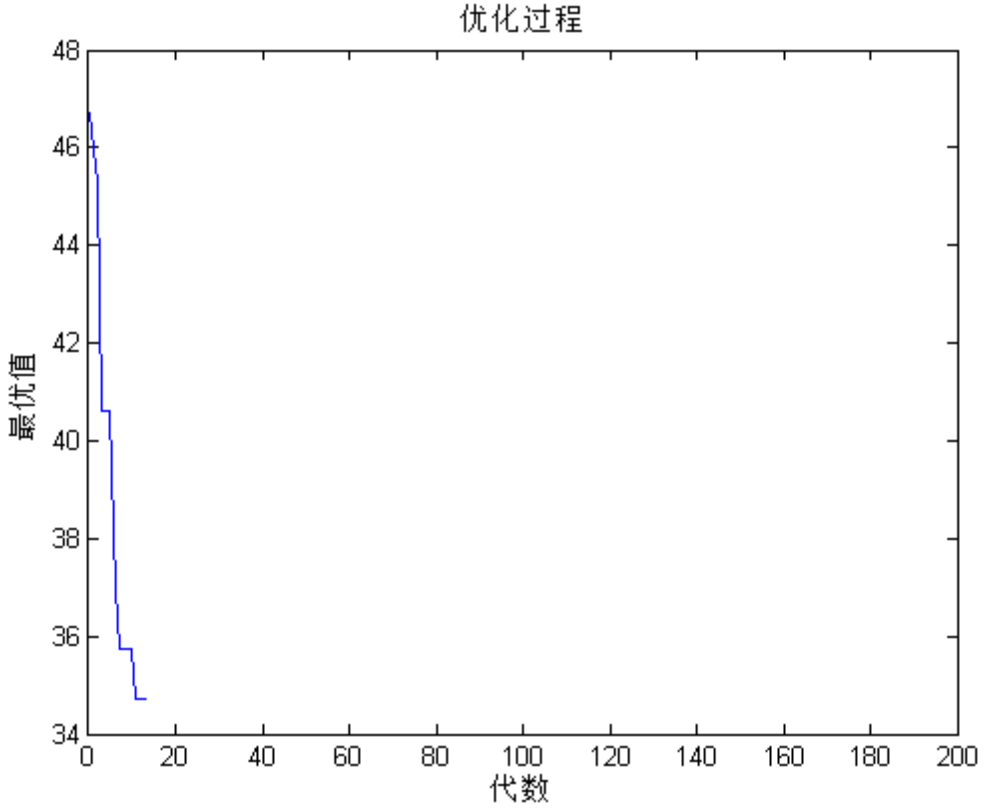

优化过程
48
46
44
42
40
38
36
34
最优值
0
20
40
60
80
100
120
140
160
180
200
代数

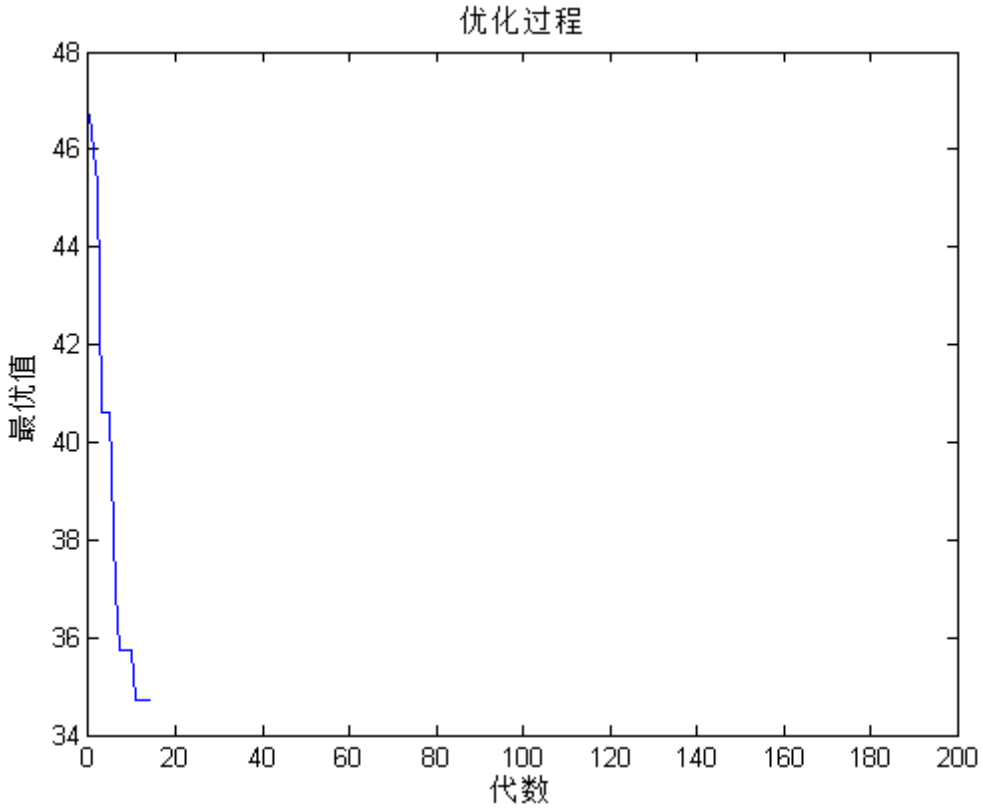

优化过程
48
46
44
42
40
38
36
34
最优值
0
20
40
60
80
100
120
140
160
180
200
代数

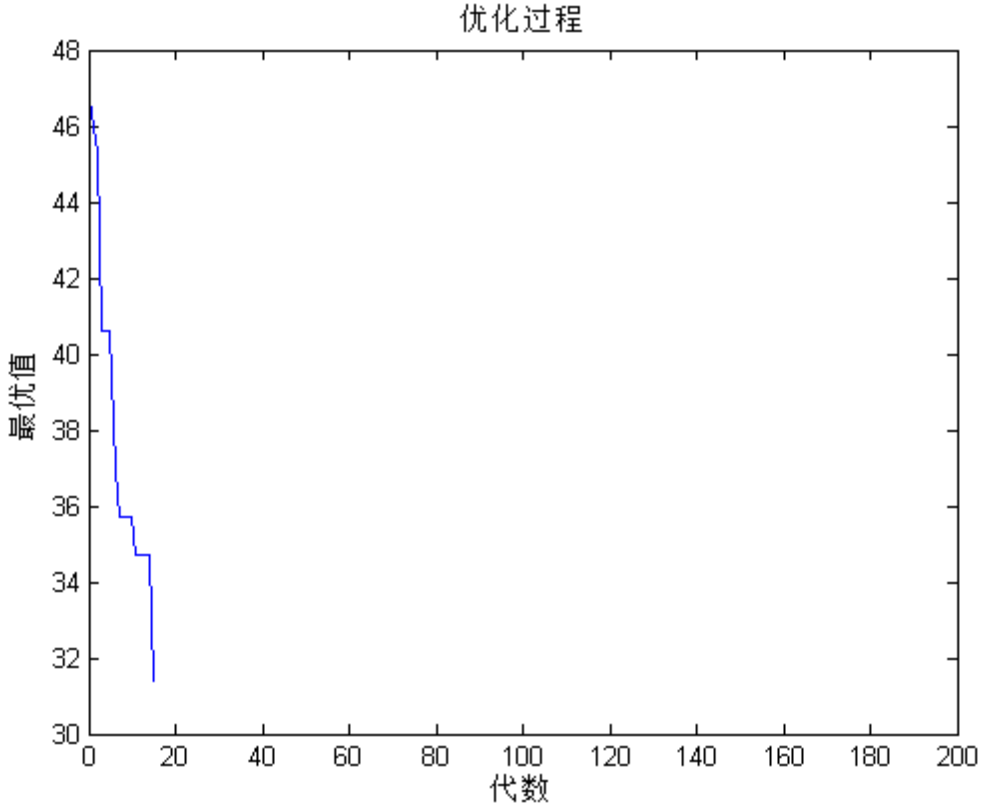

优化过程
最优值
代数
48
46
44
42
40
38
36
34
0
20
40
60
80
100
120
140
160
180
200

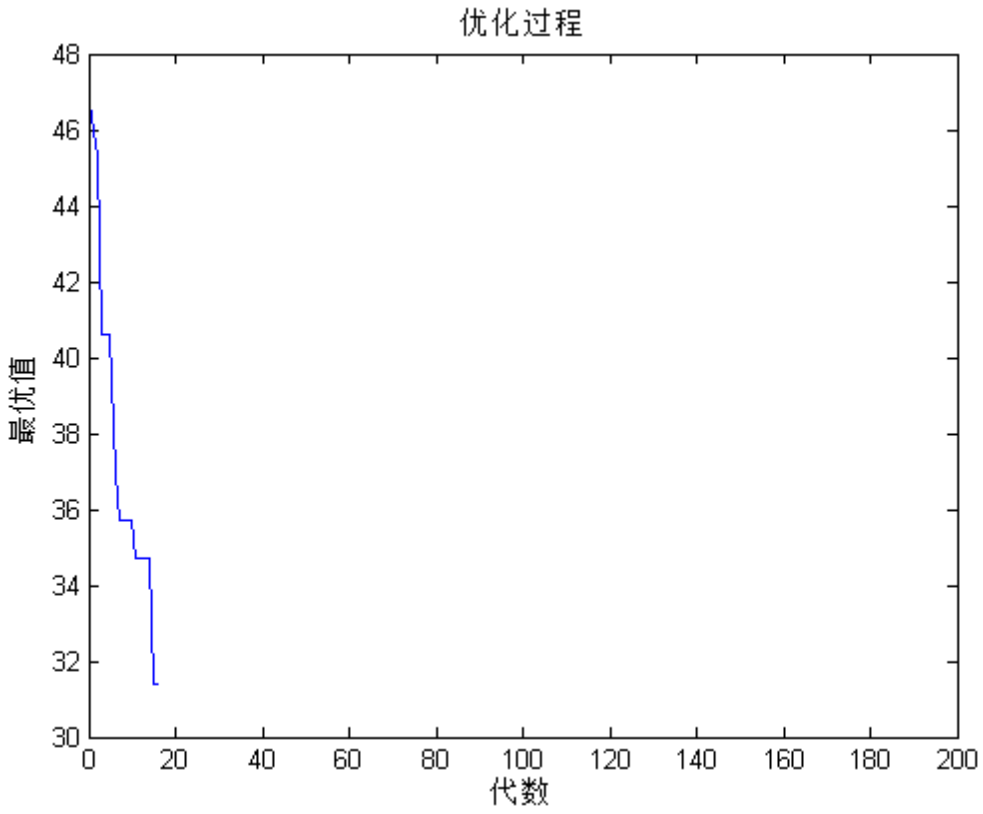

优化过程
最优值
代数
48
46
44
42
40
38
36
34
0
20
40
60
80
100
120
140
160
180
200

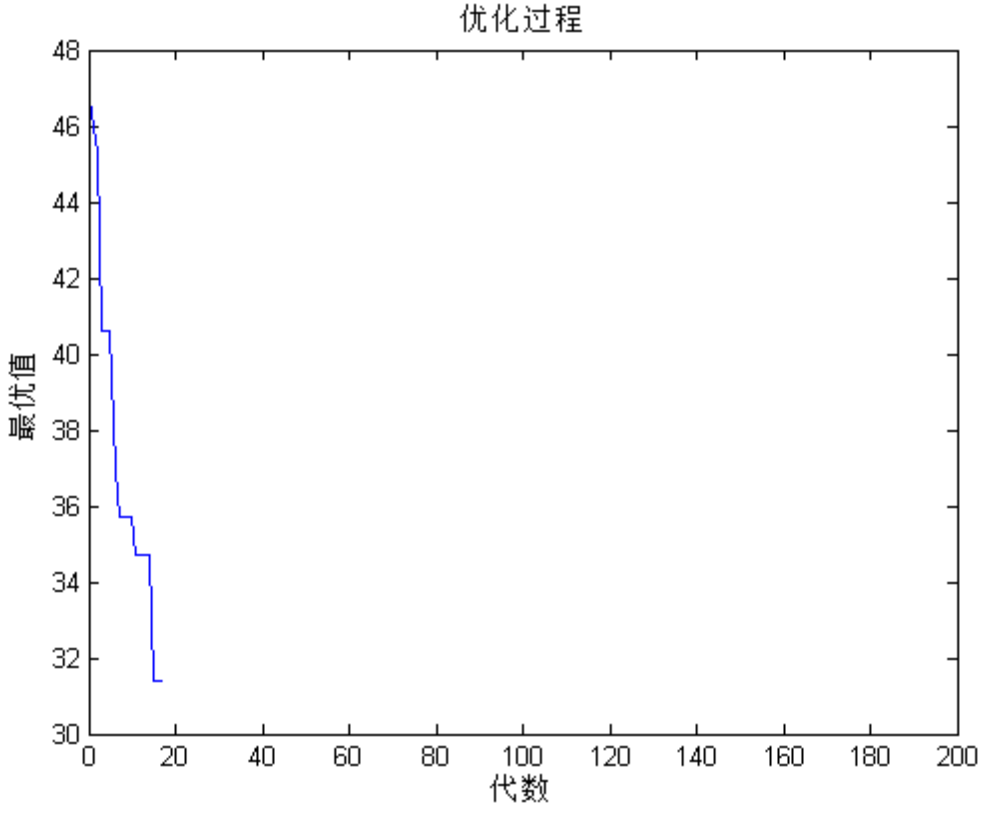

优化过程
最优值
代数
48
46
44
42
40
38
36
34
0
20
40
60
80
100
120
140
160
180
200

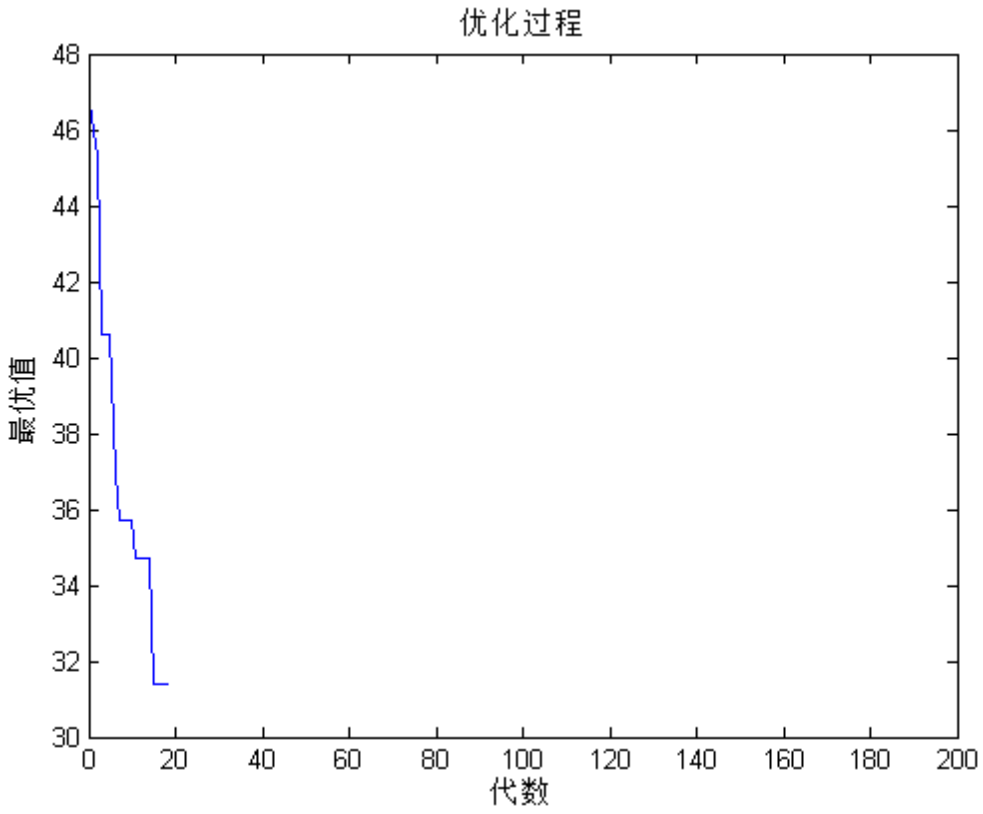

优化过程
最优值
代数
48
46
44
42
40
38
36
34
0
20
40
60
80
100
120
140
160
180
200

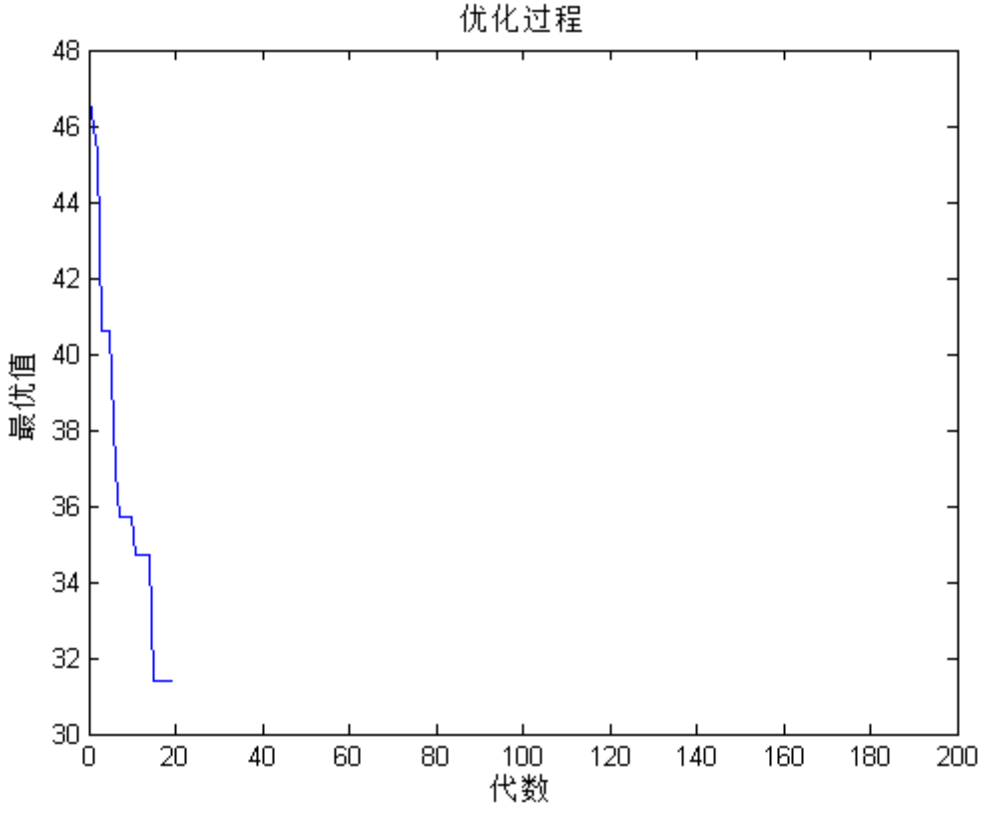

优化过程
最优值
代数
48
46
44
42
40
38
36
34
0
20
40
60
80
100
120
140
160
180
200

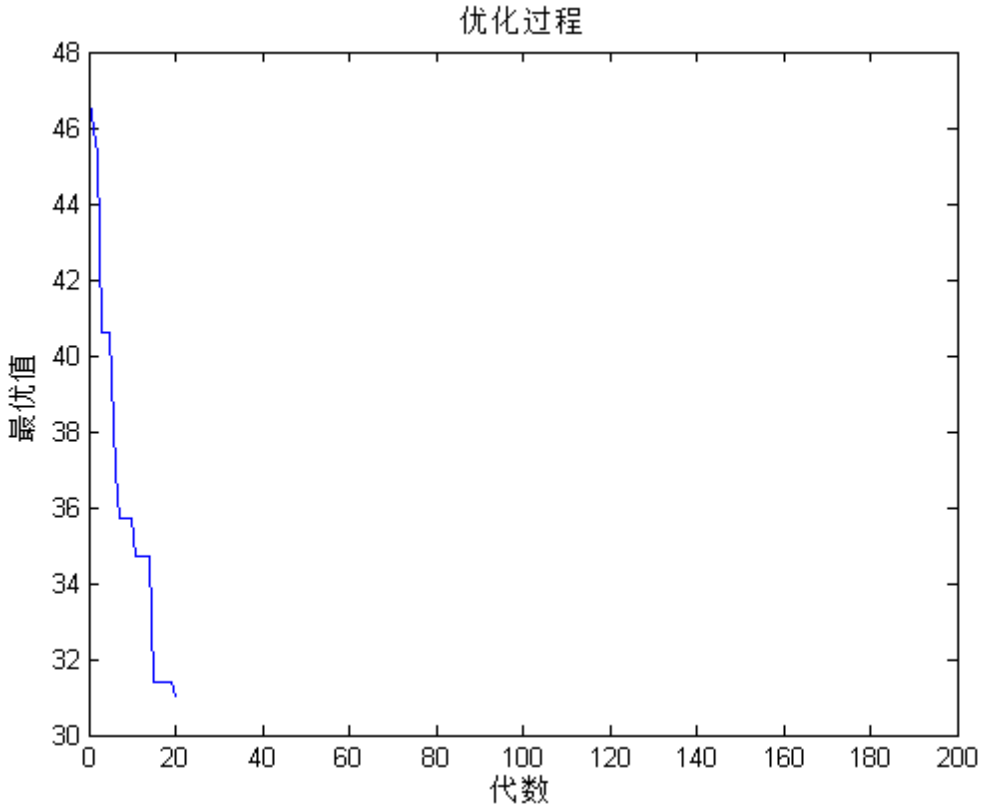

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
0
20
40
60
80
100
120
140
160
180
200

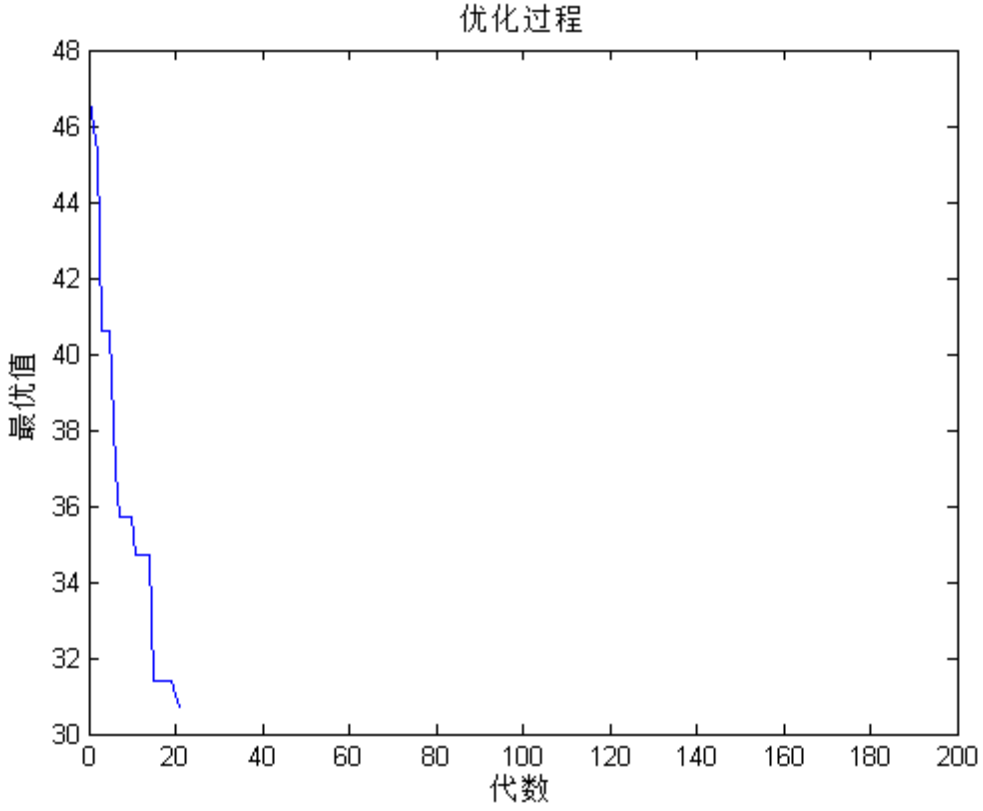

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
0
20
40
60
80
100
120
140
160
180
200

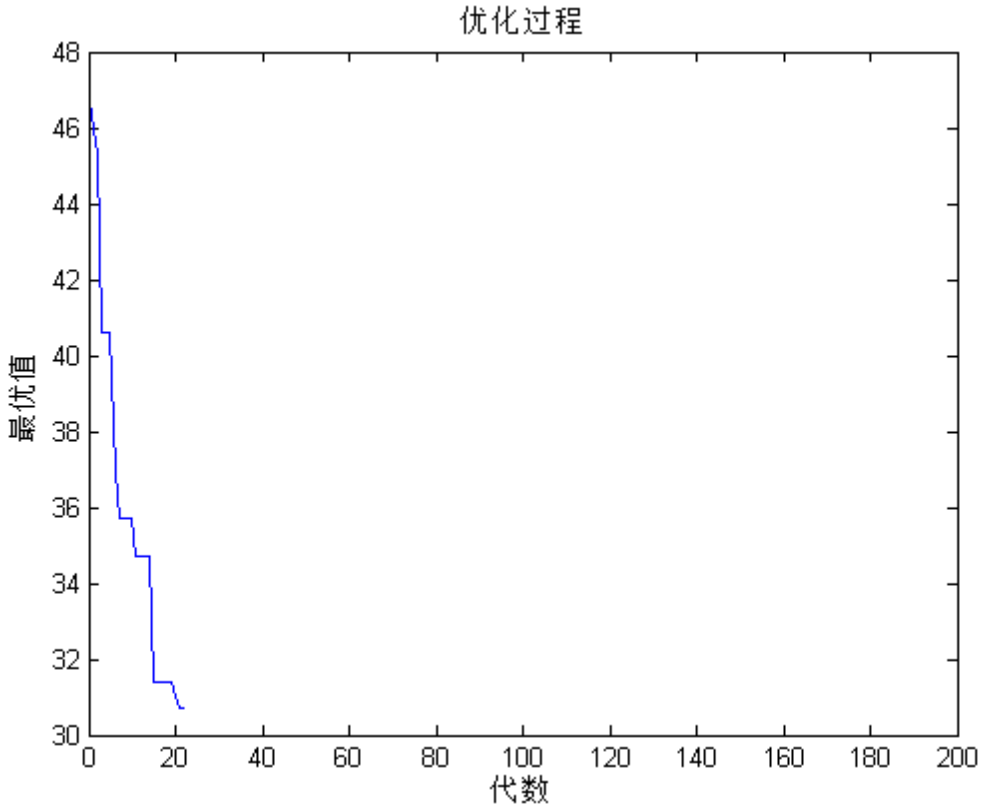

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
0
20
40
60
80
100
120
140
160
180
200

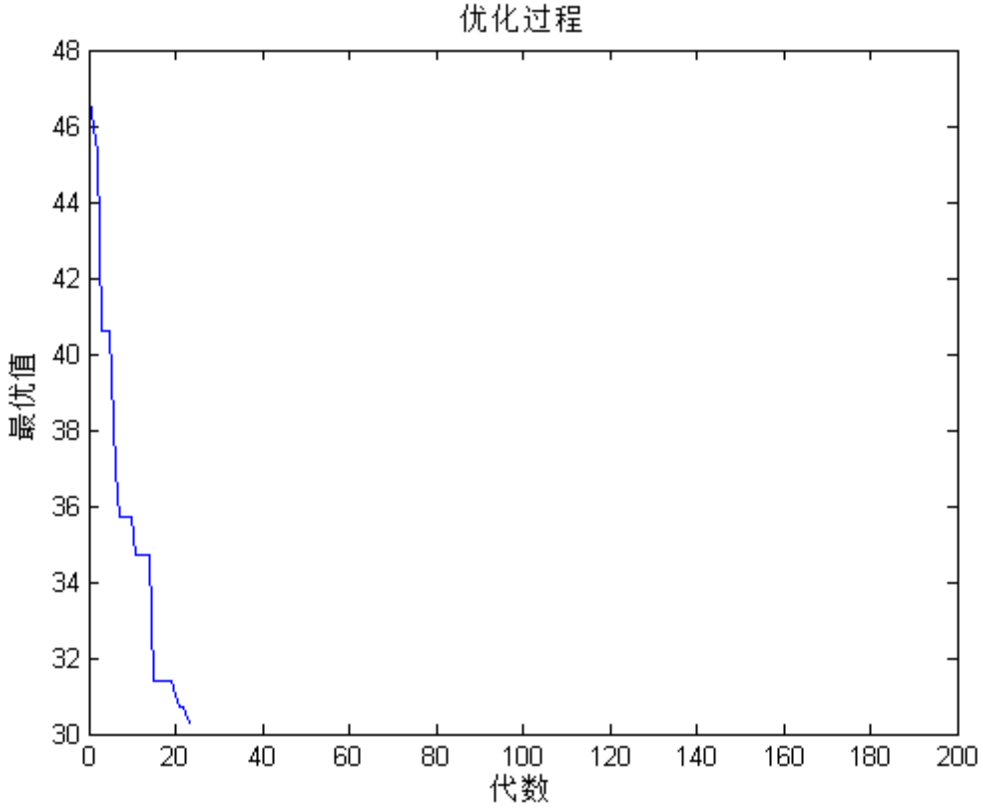

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
0
20
40
60
80
100
120
140
160
180
200

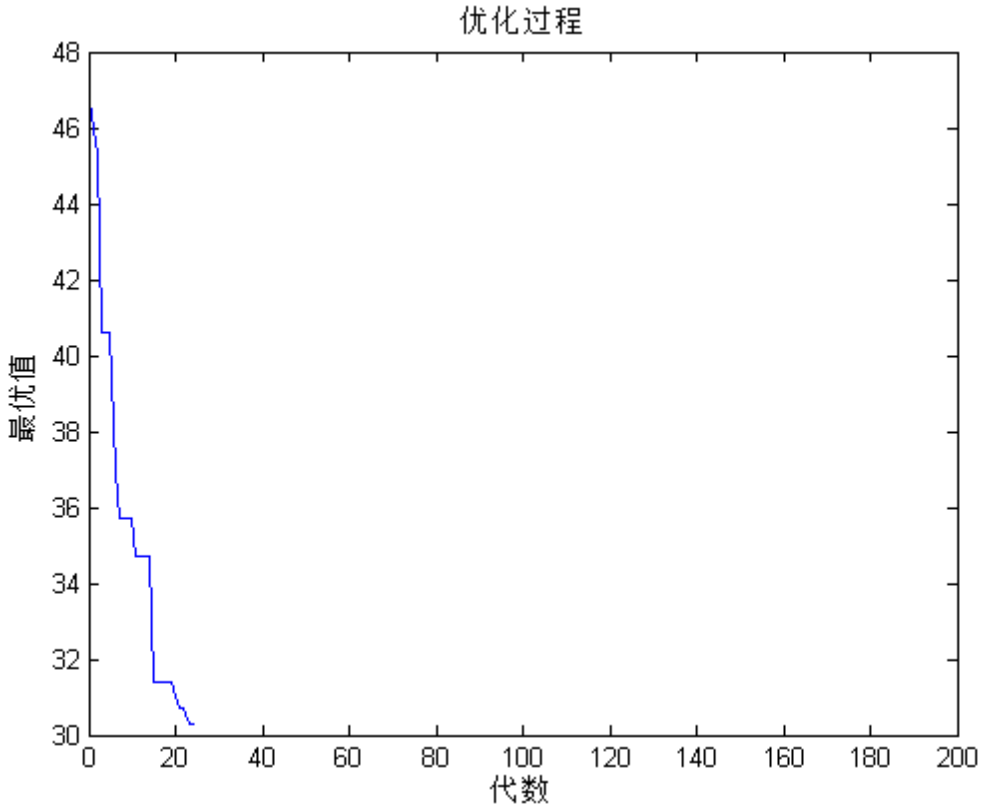

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
0
20
40
60
80
100
120
140
160
180
200

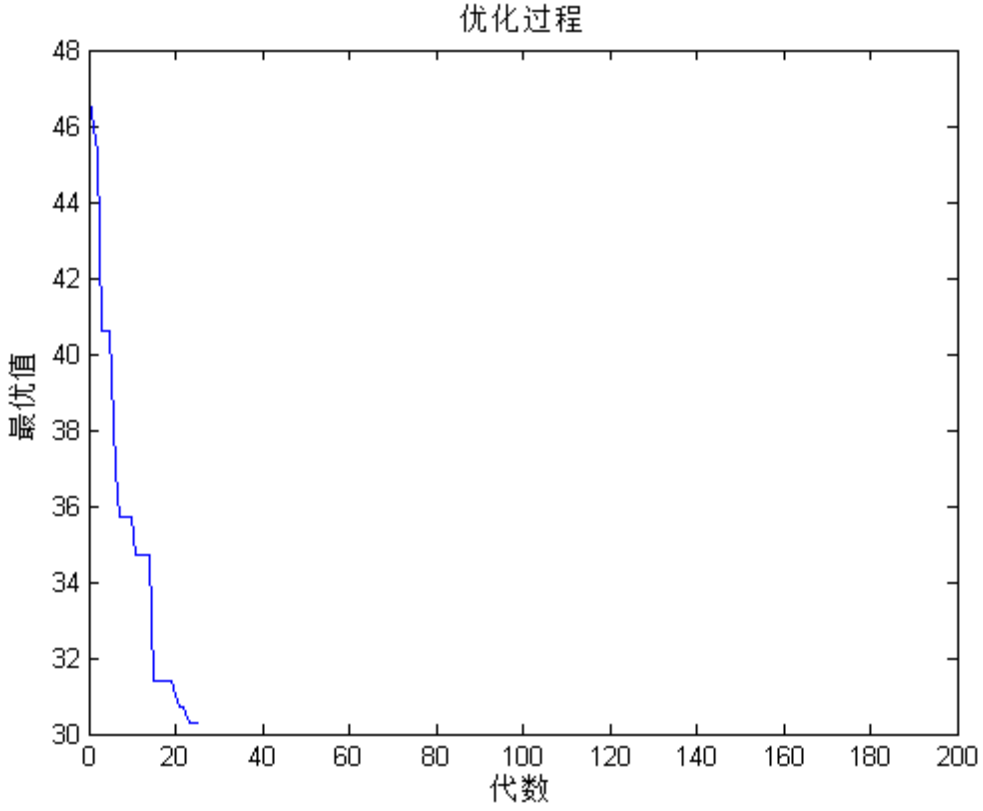

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
0
20
40
60
80
100
120
140
160
180
200

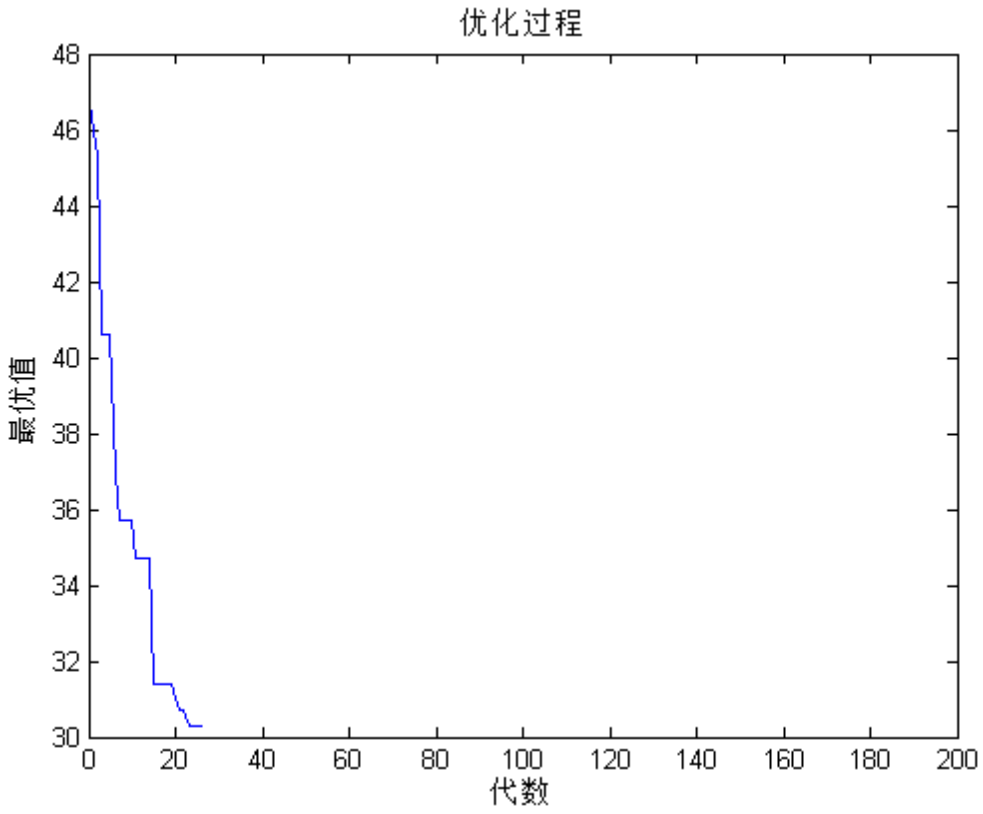

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
0
20
40
60
80
100
120
140
160
180
200

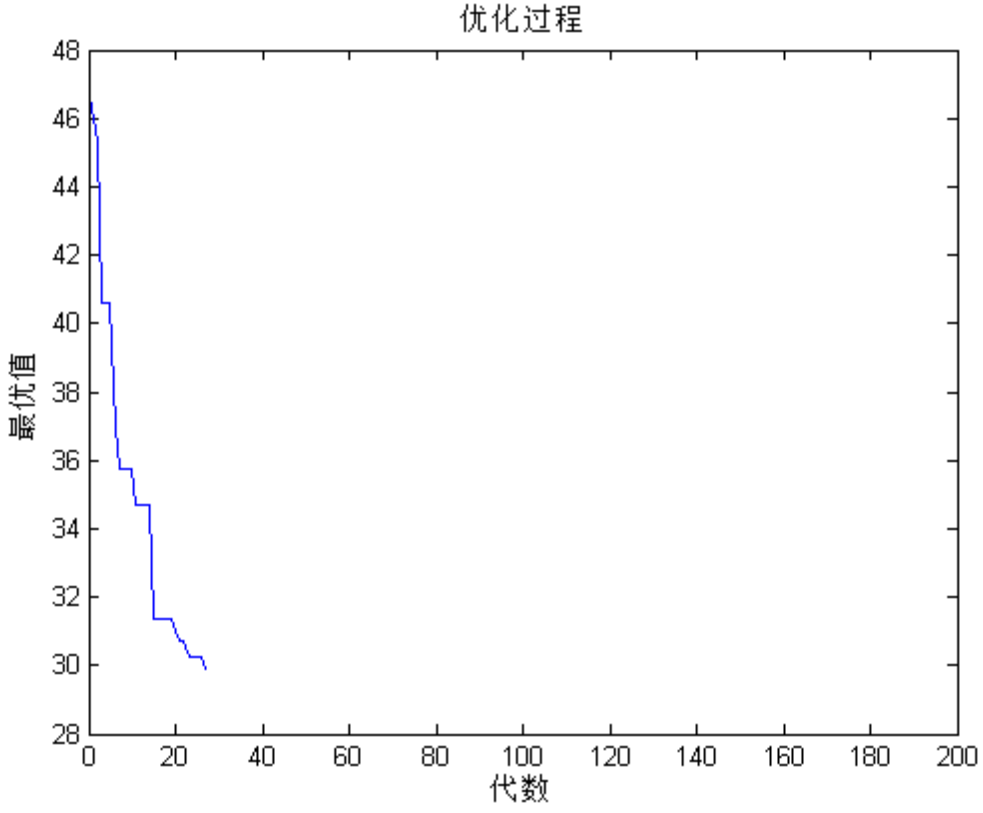

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
0
20
40
60
80
100
120
140
160
180
200

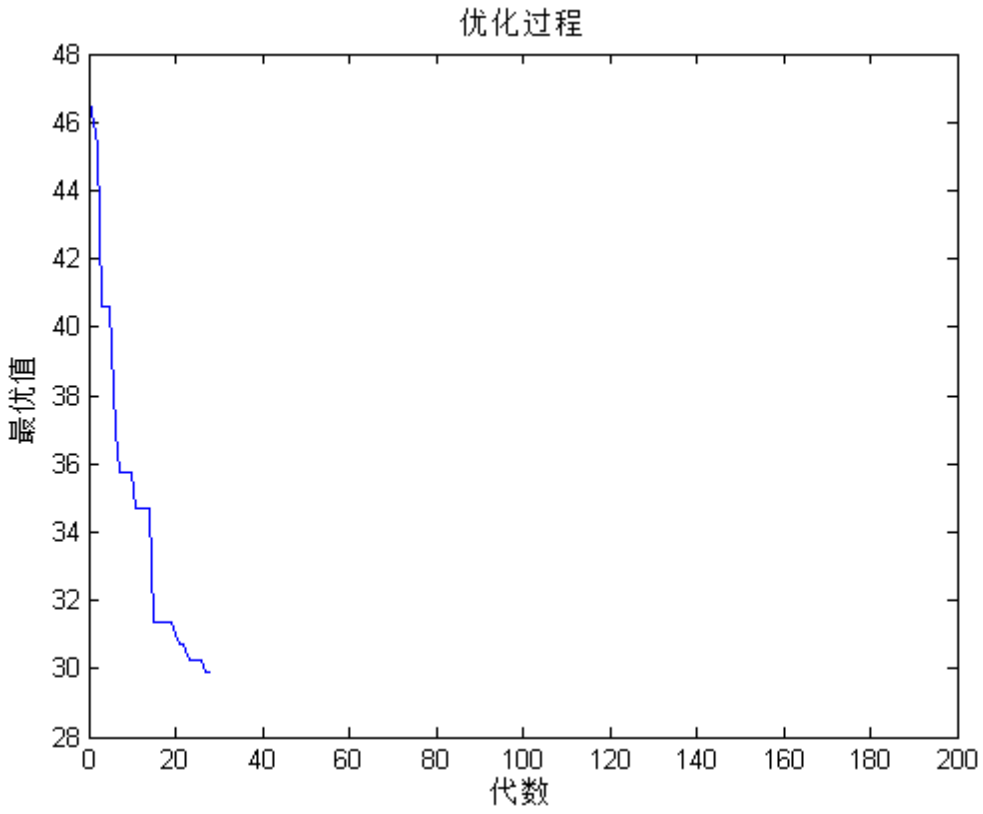

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
0
20
40
60
80
100
120
140
160
180
200

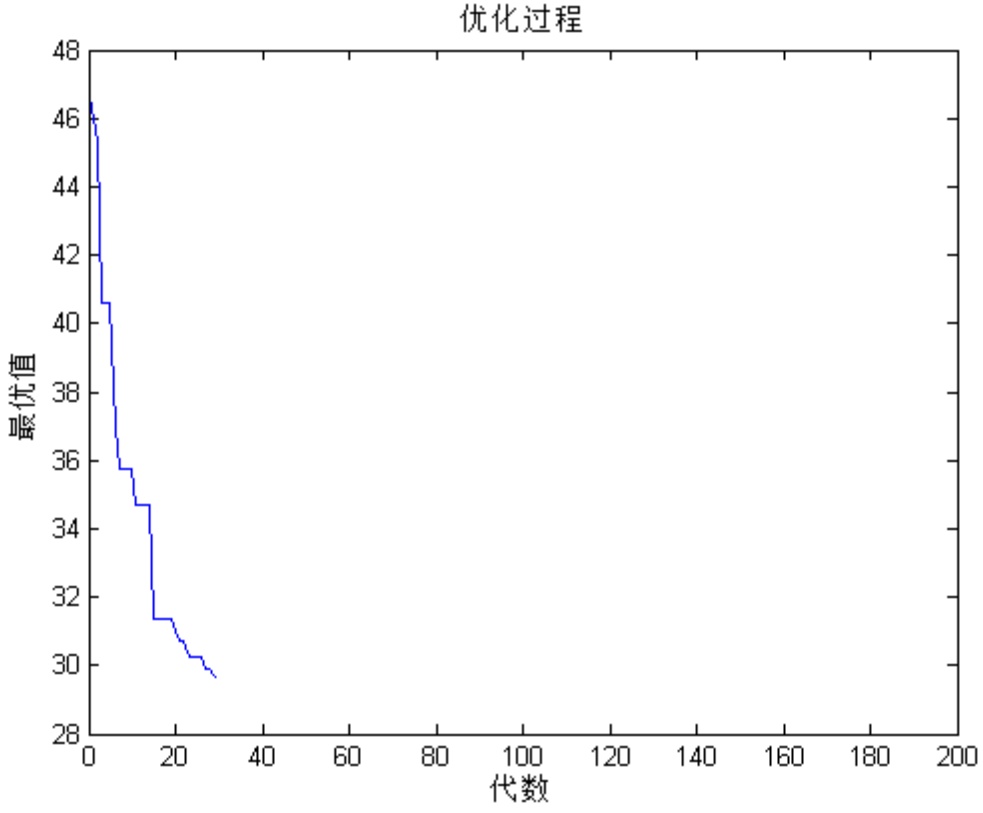

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
0
20
40
60
80
100
120
140
160
180
200

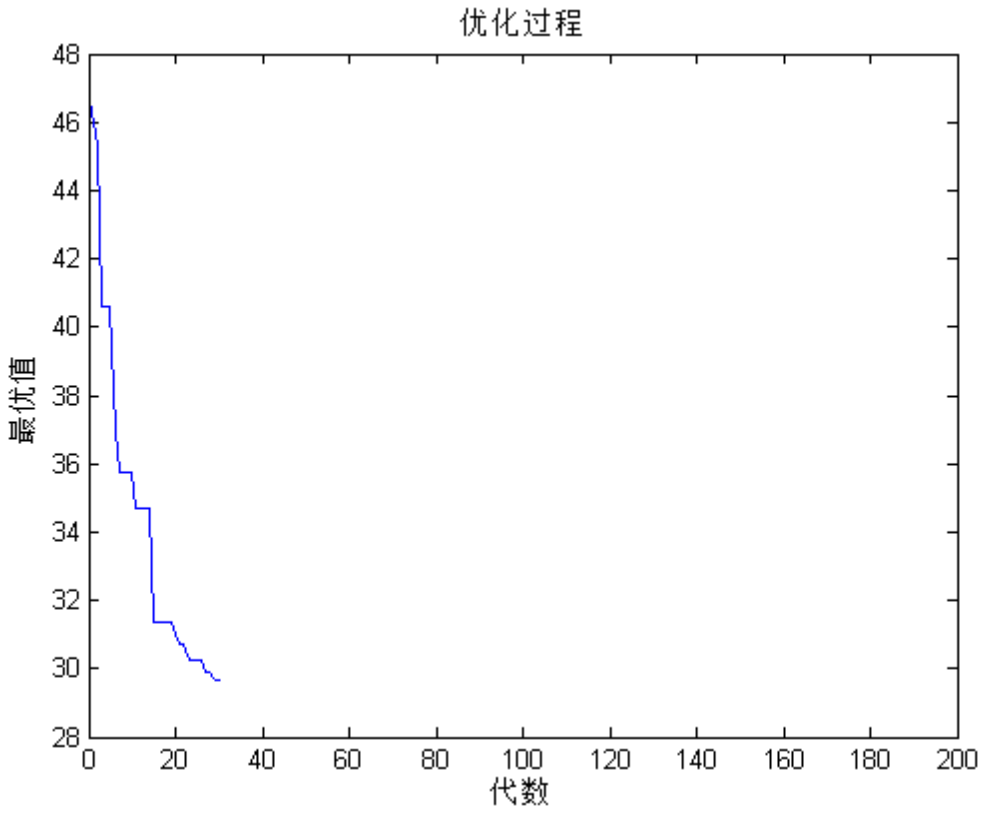

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
0
20
40
60
80
100
120
140
160
180
200

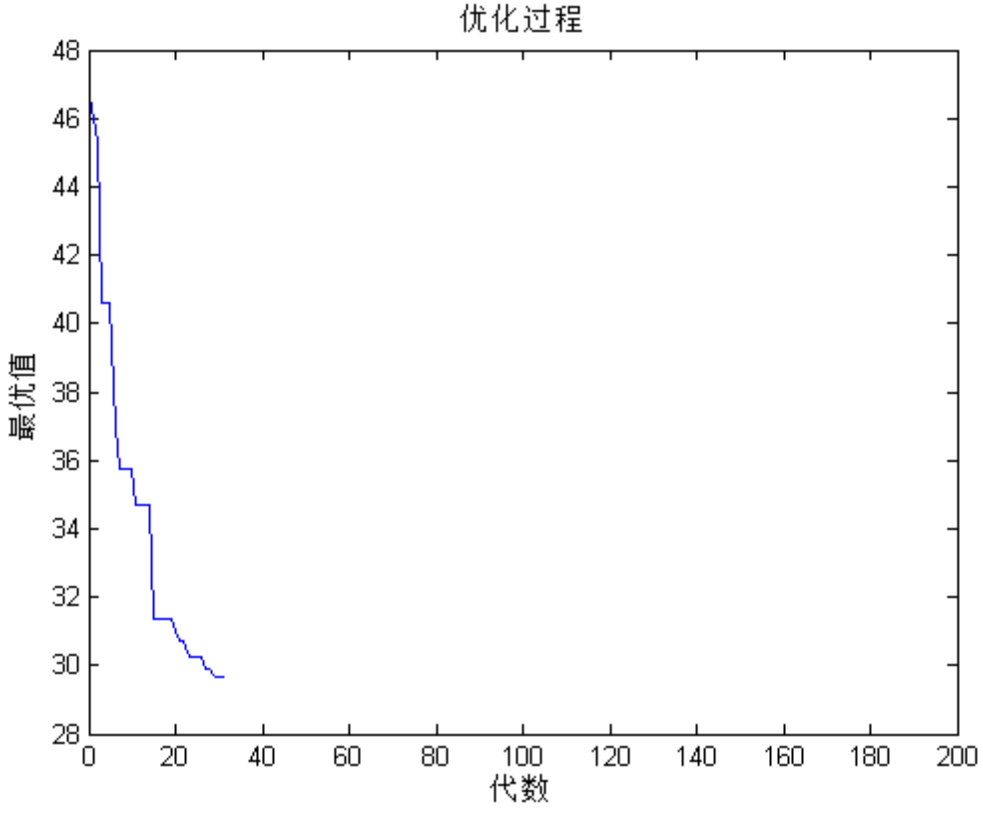

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
0
20
40
60
80
100
120
140
160
180
200

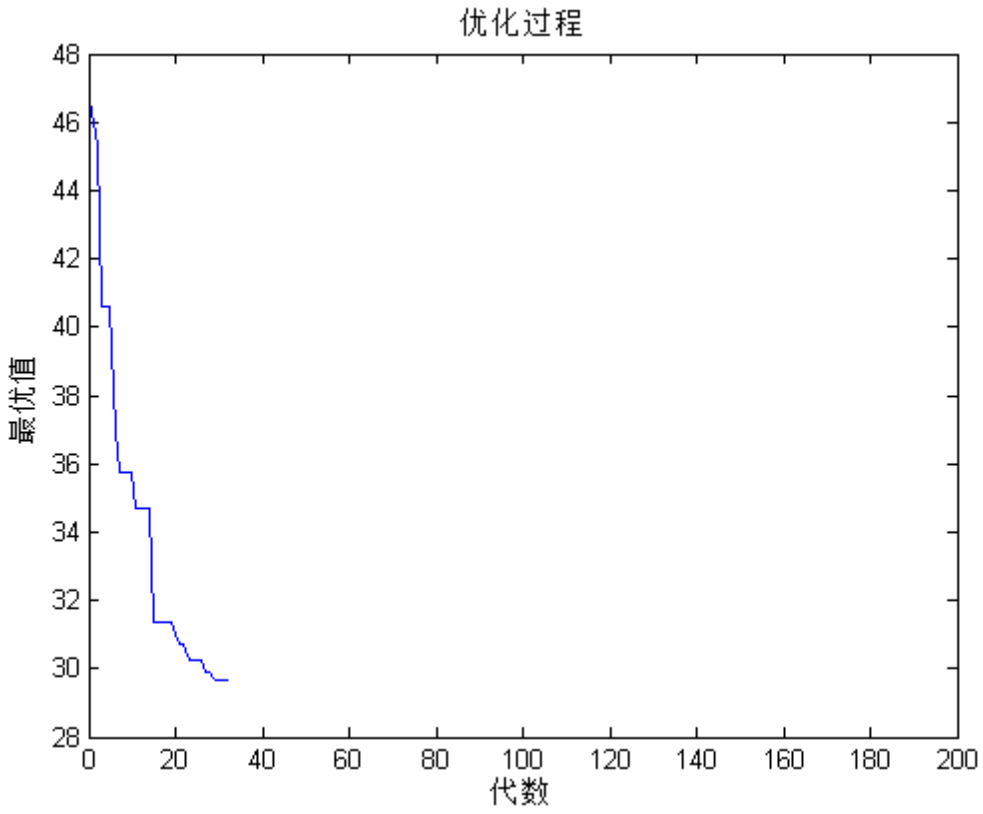

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

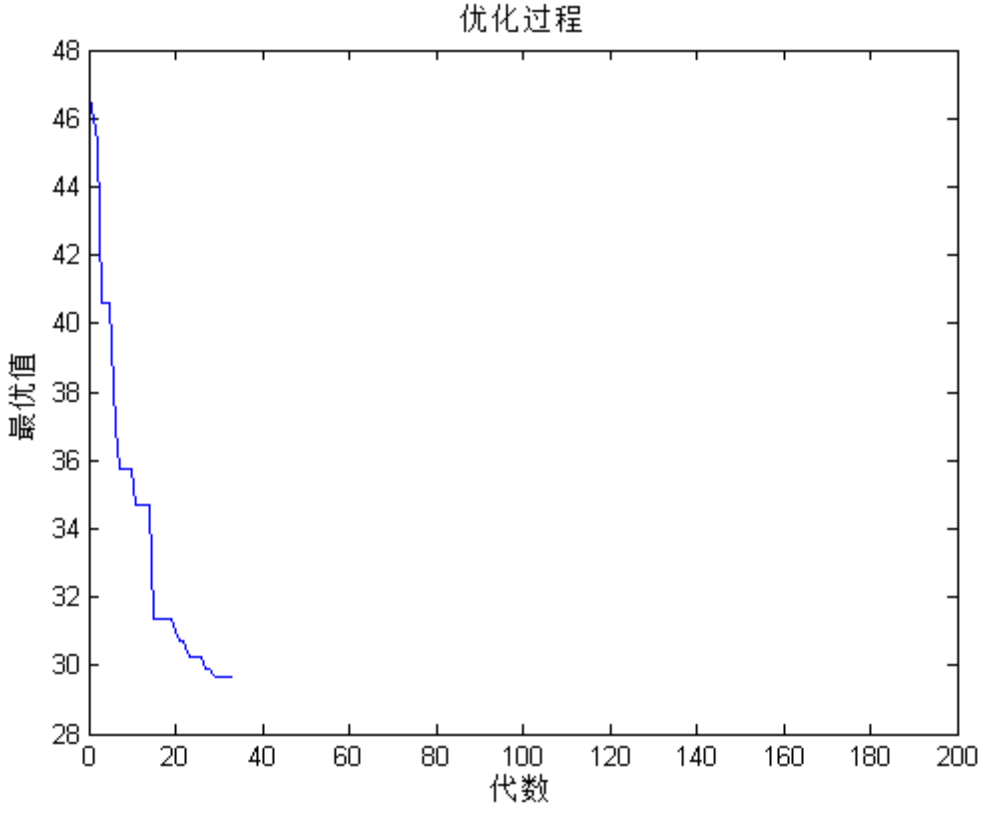

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

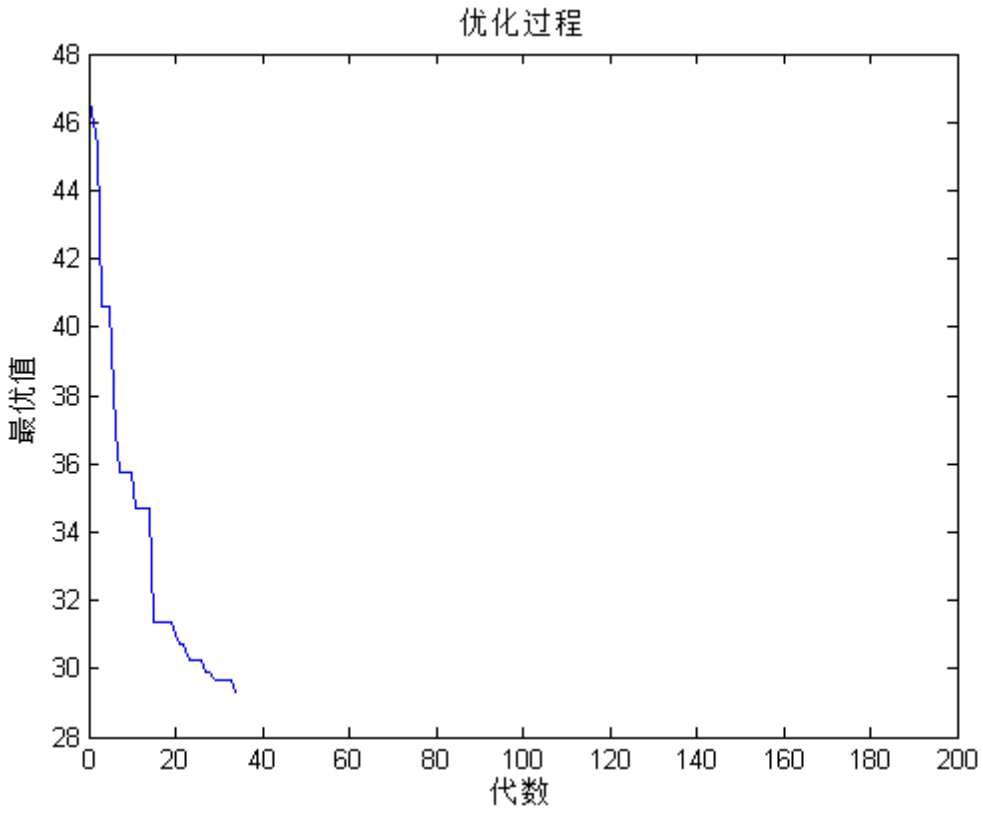

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

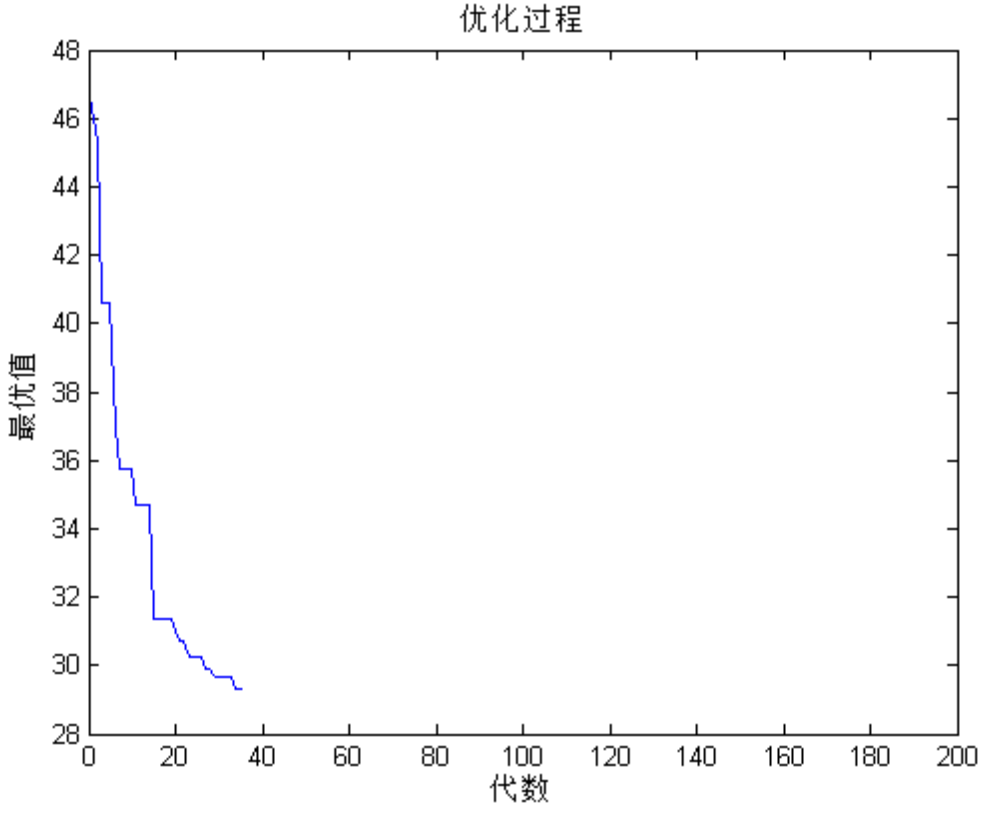

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

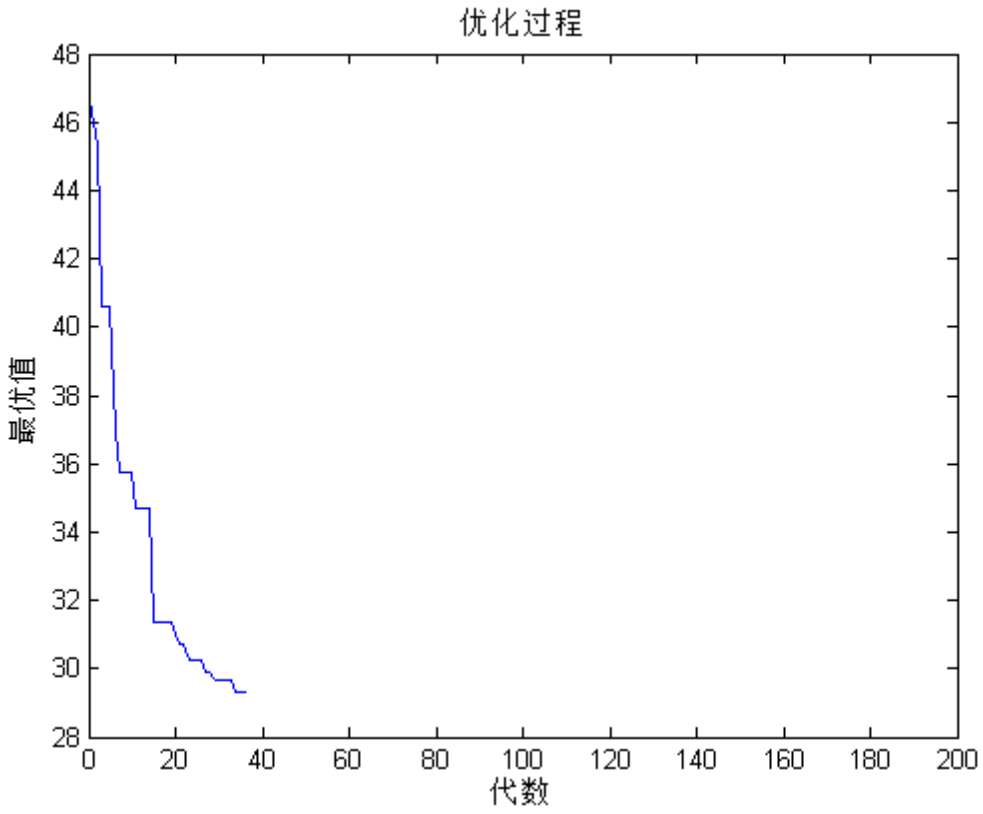

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

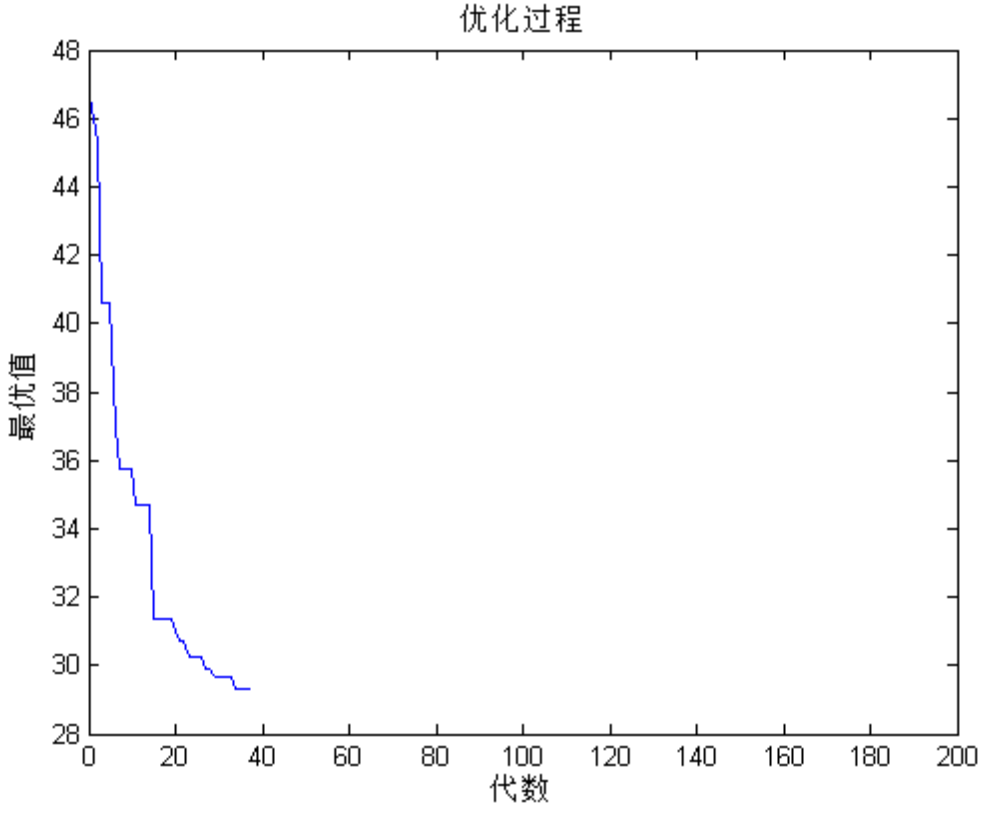

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

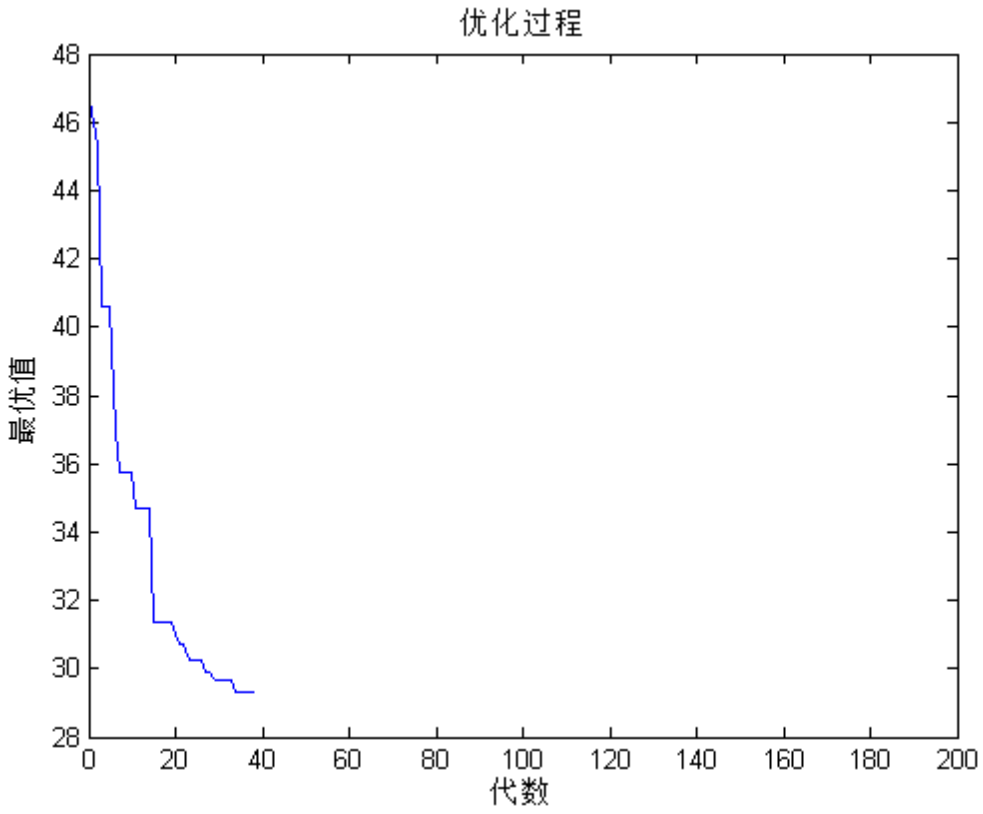

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

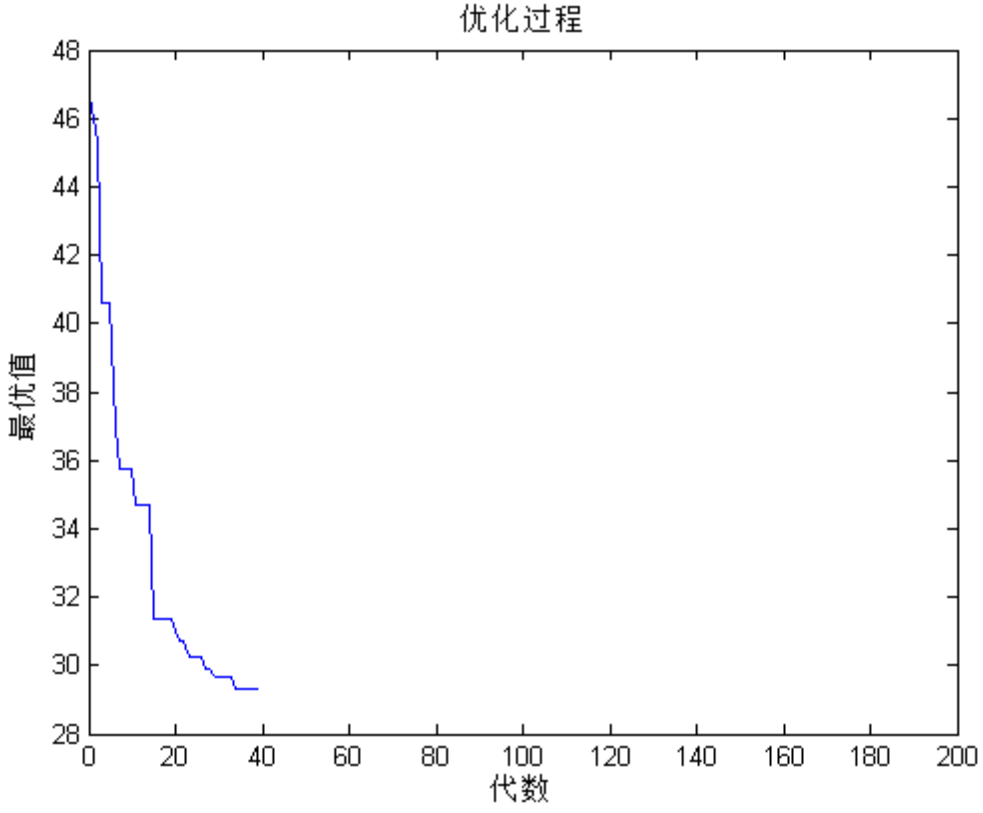

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

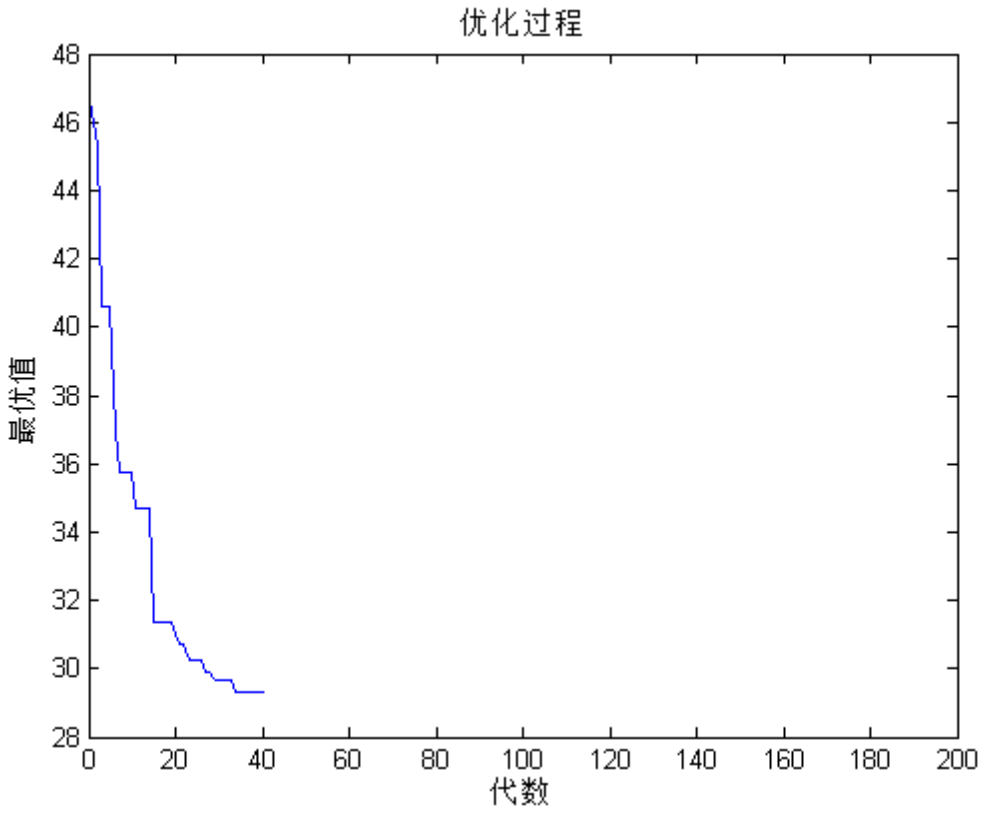

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

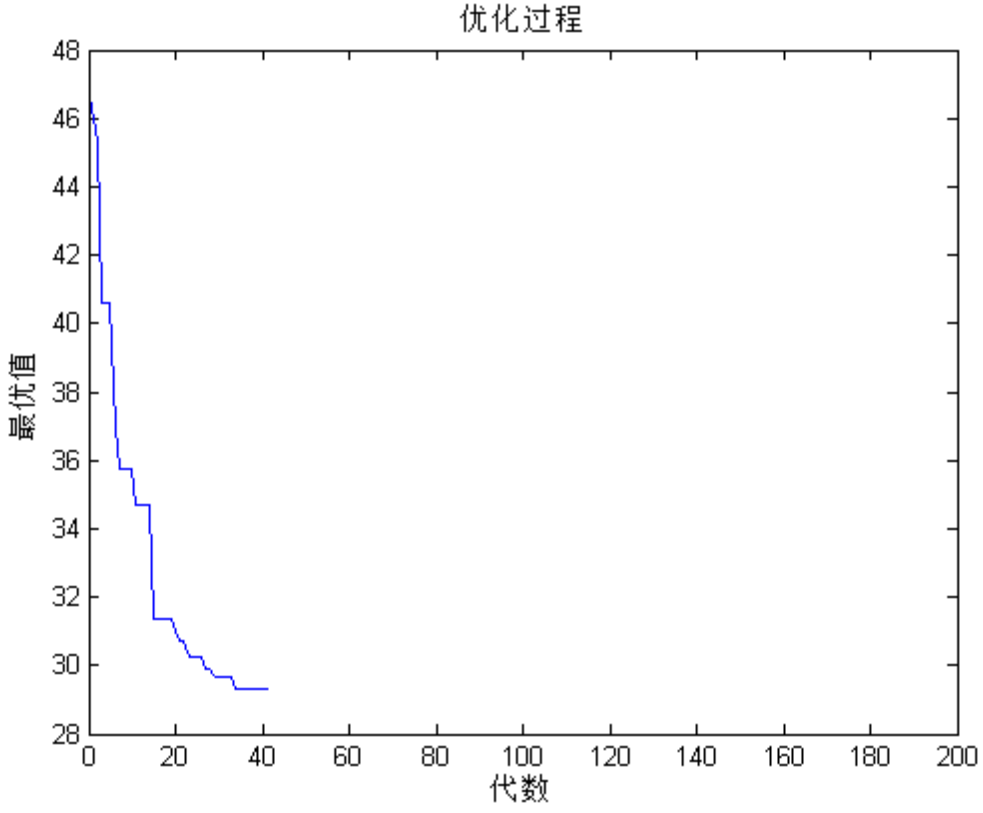

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

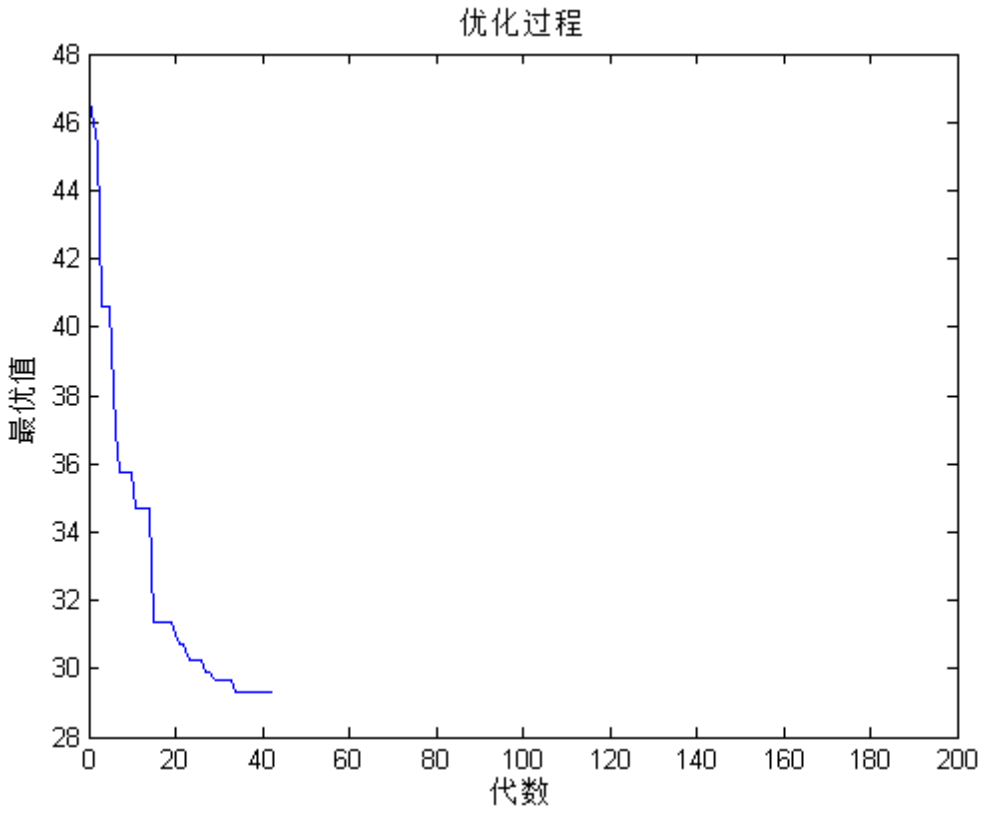

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

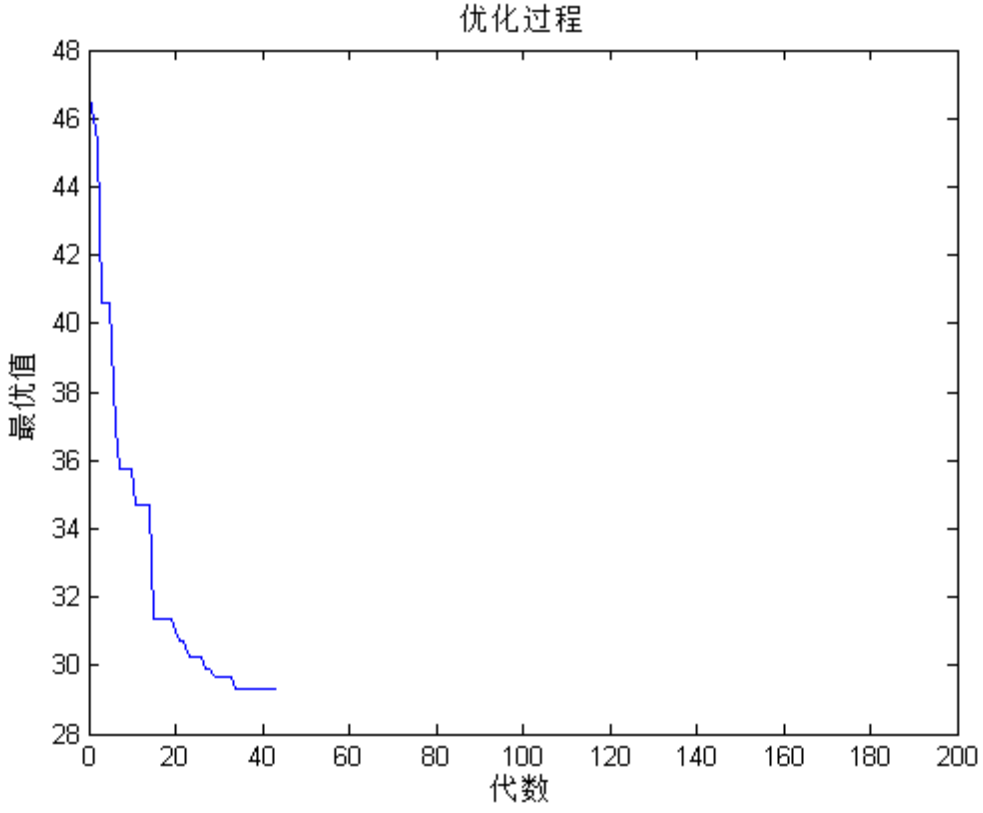

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

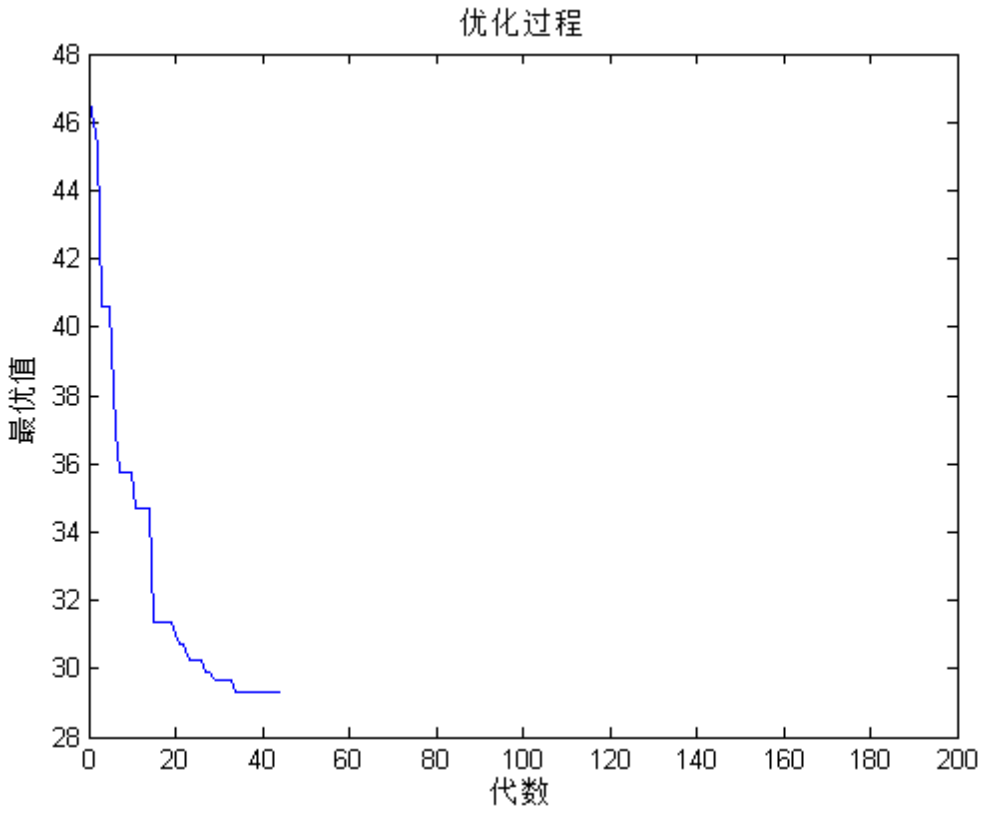

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

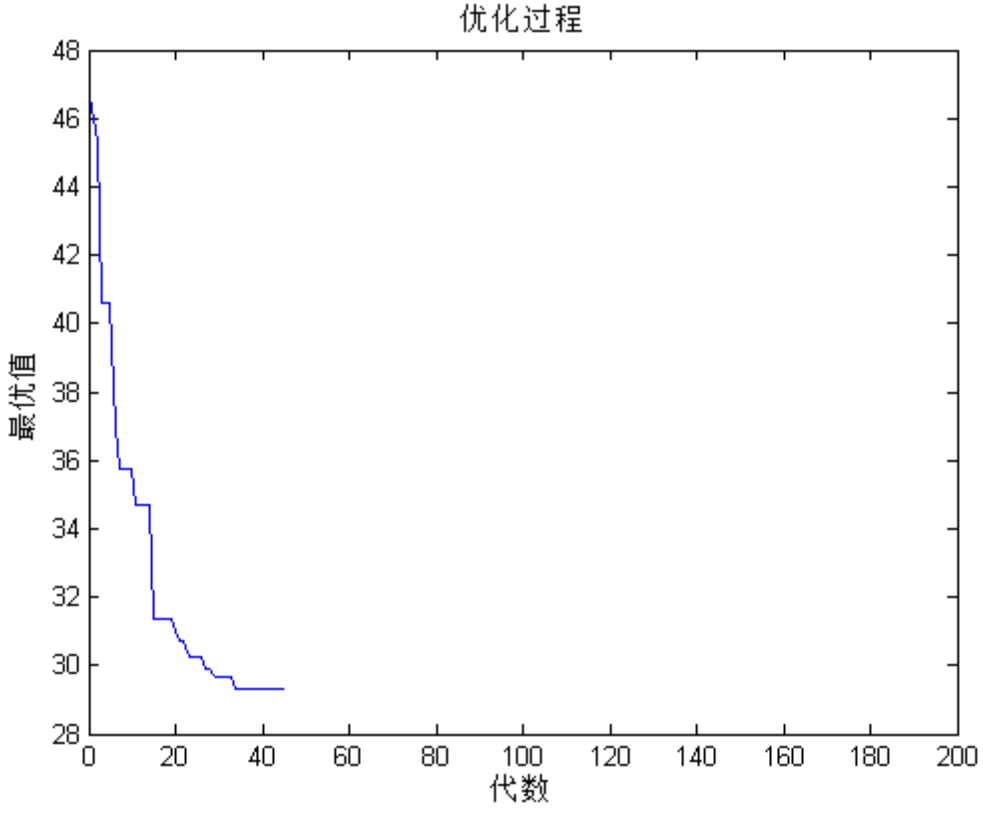

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

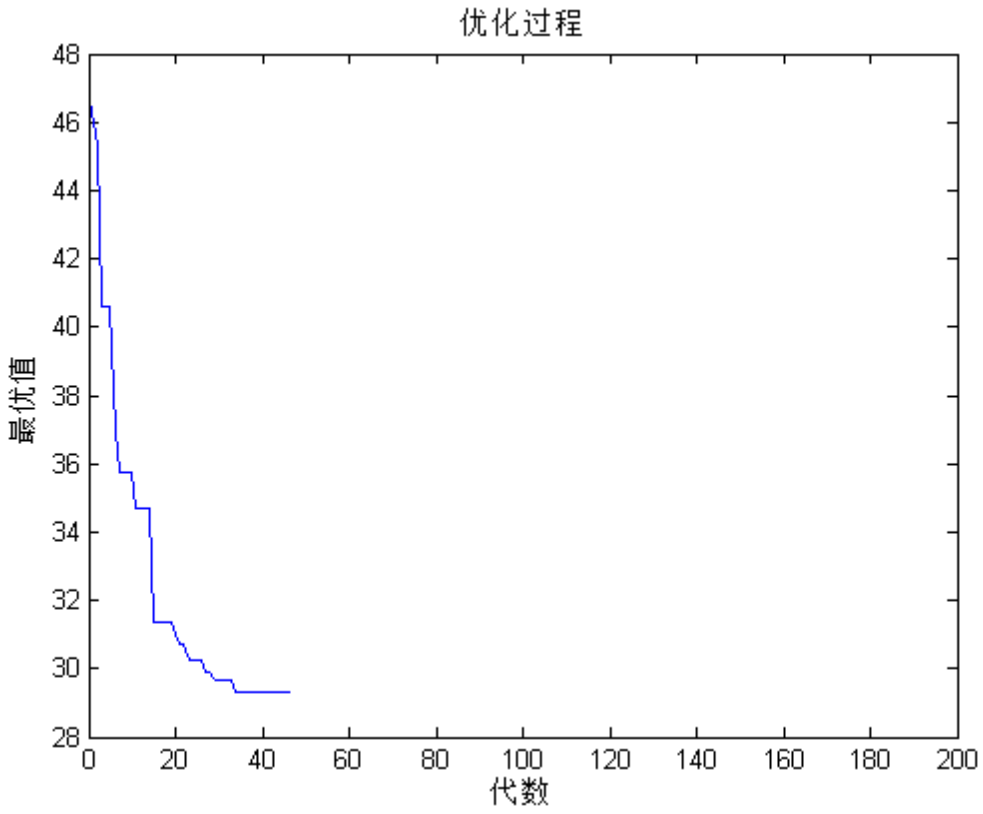

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

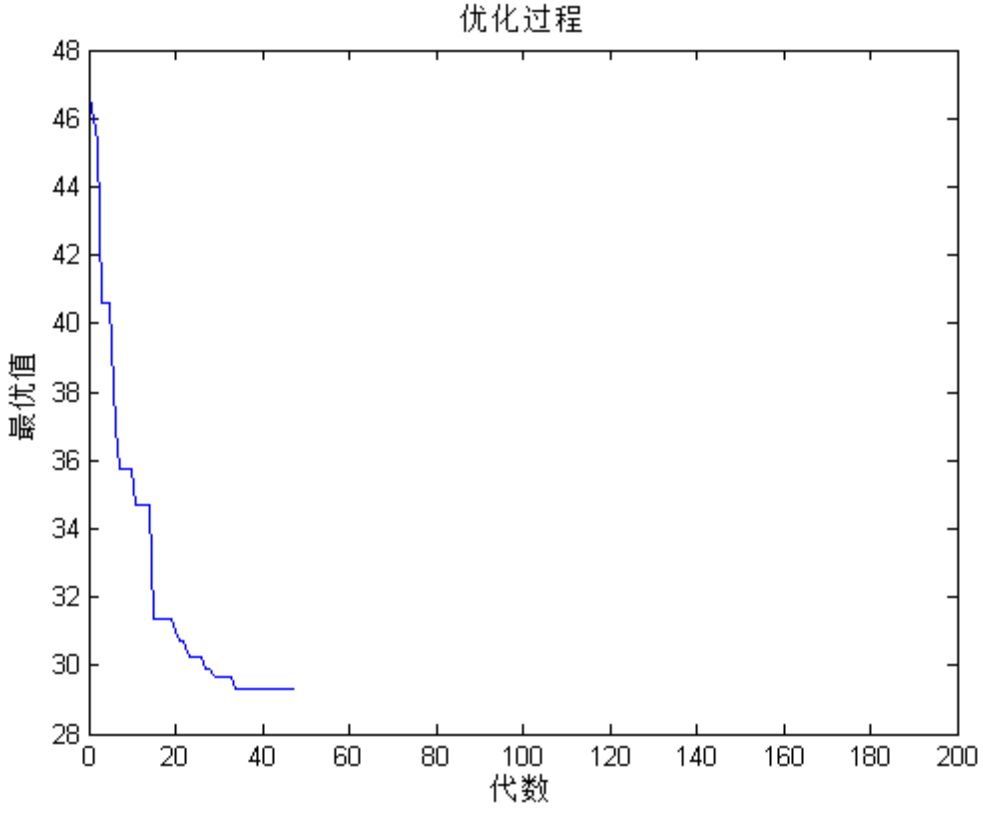

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

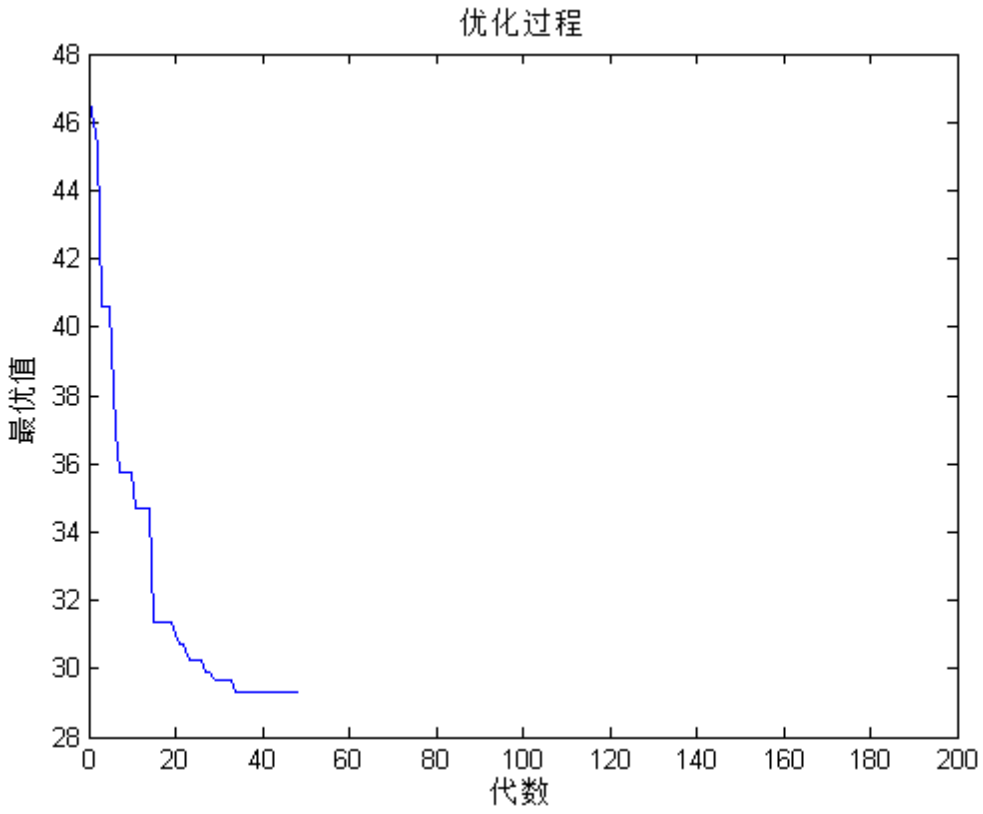

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

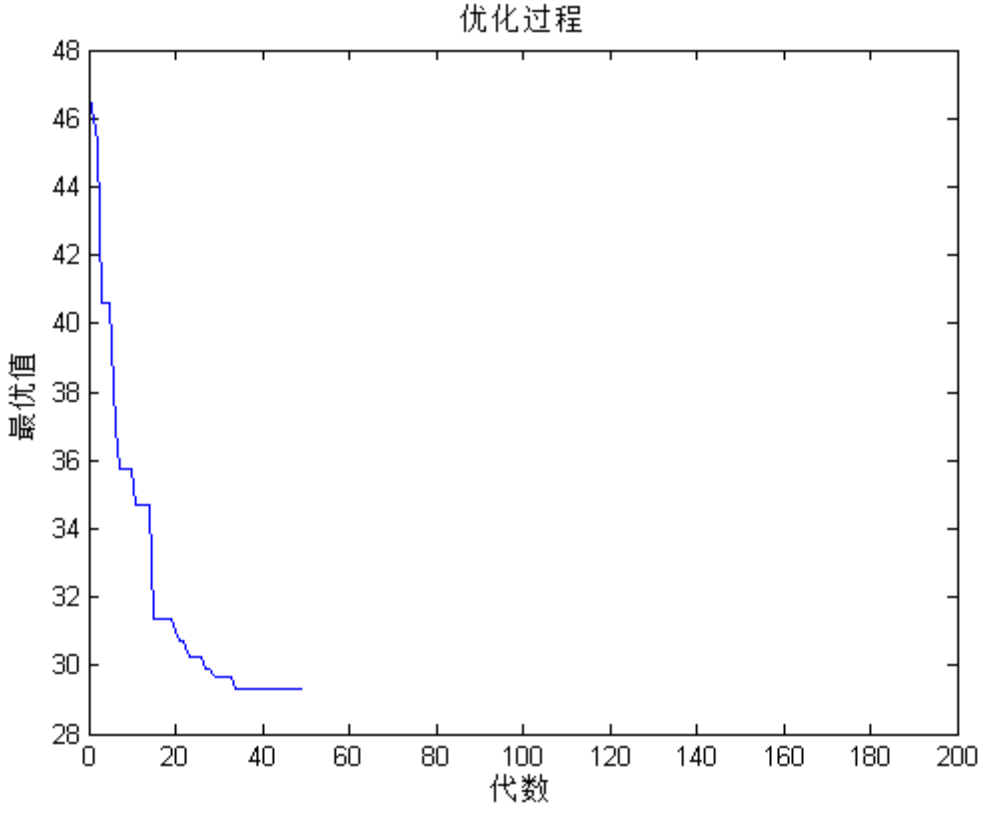

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

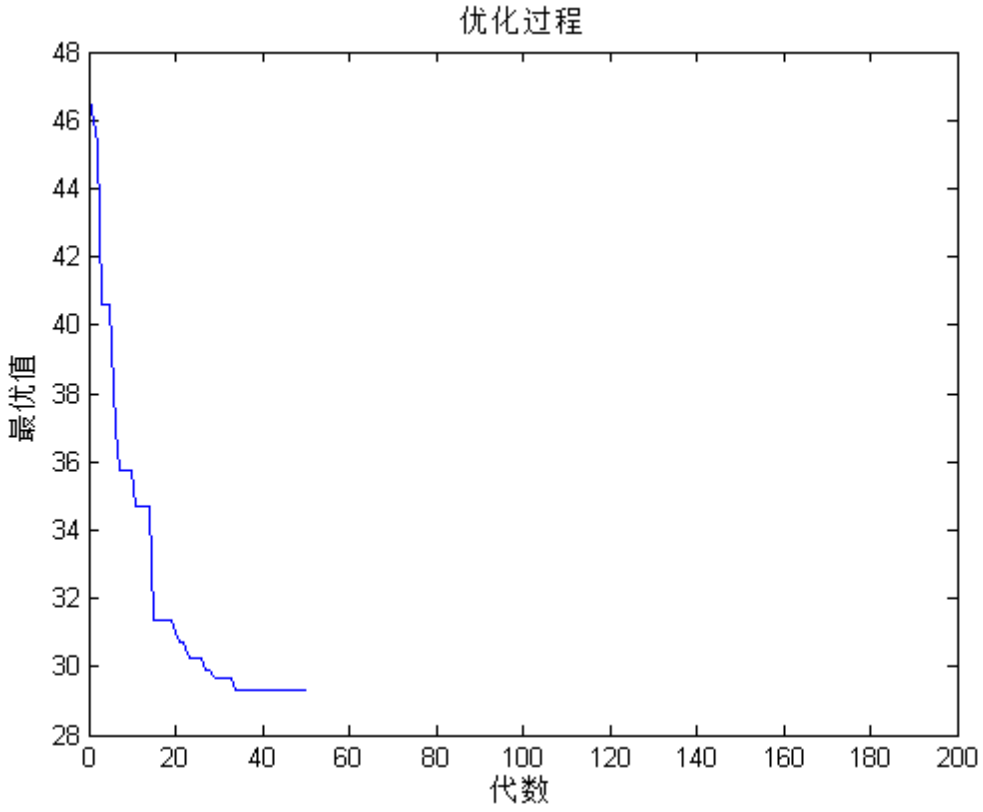

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

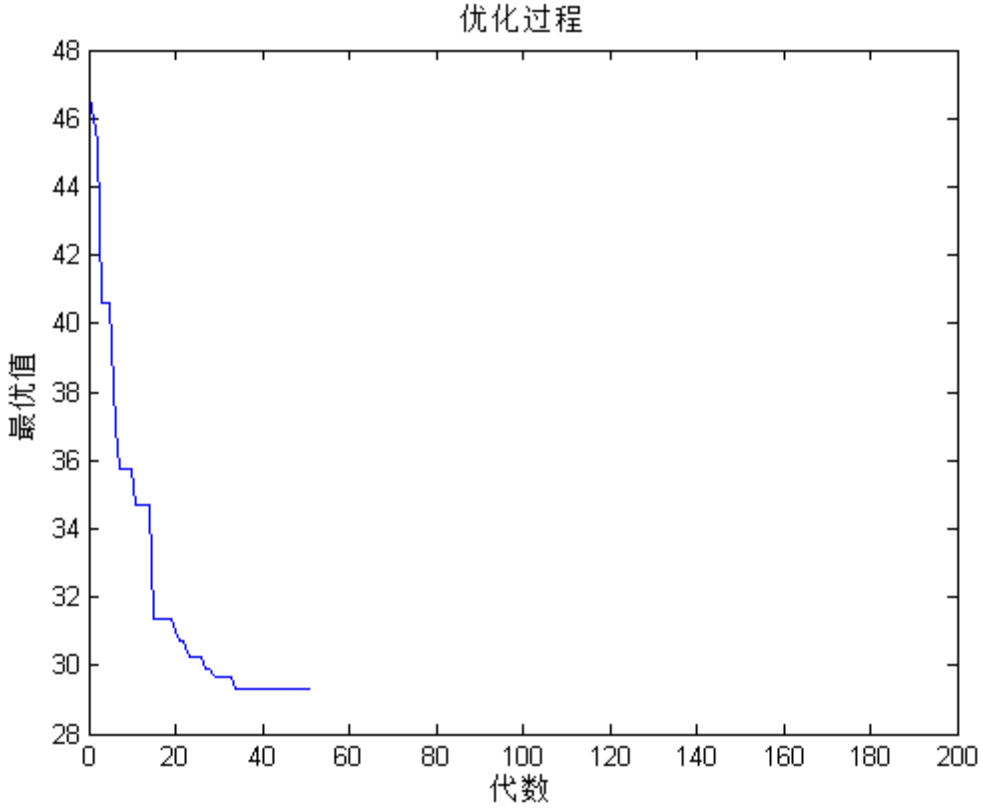

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

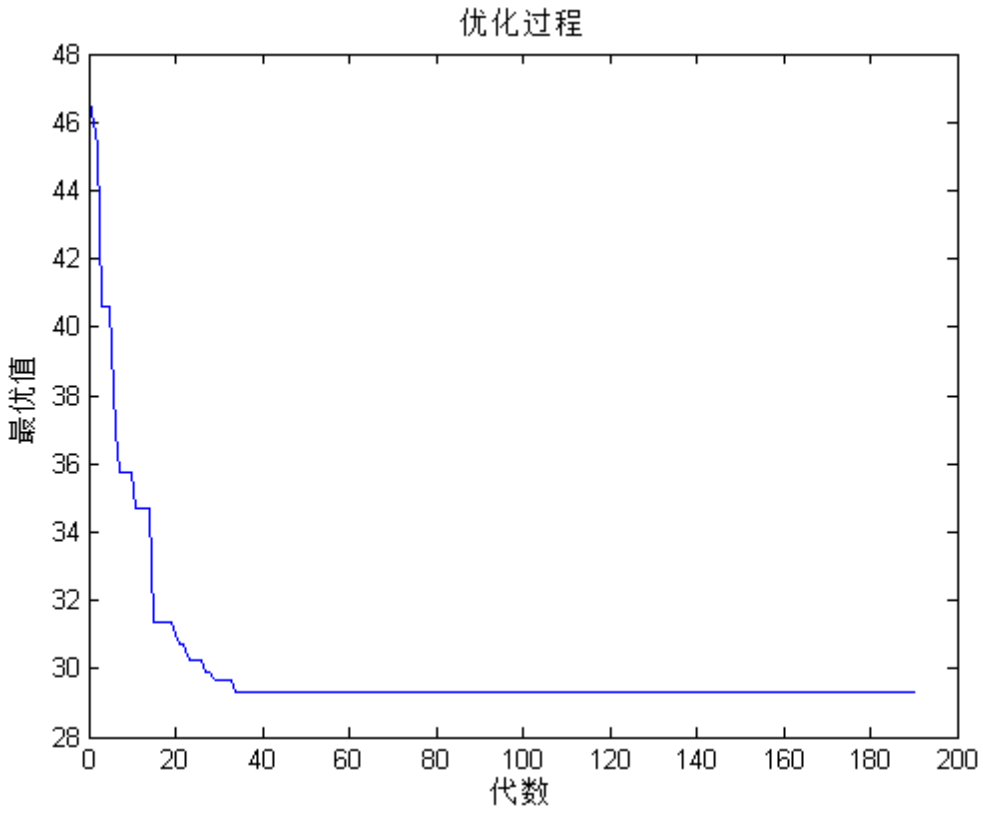

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

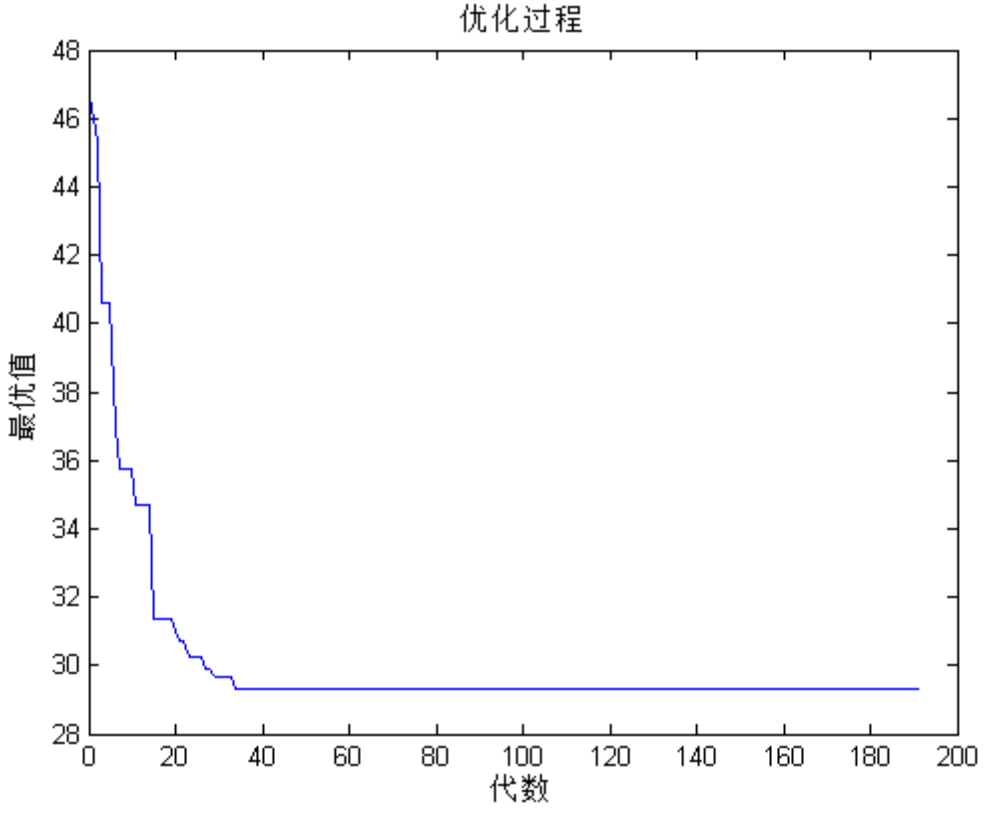

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

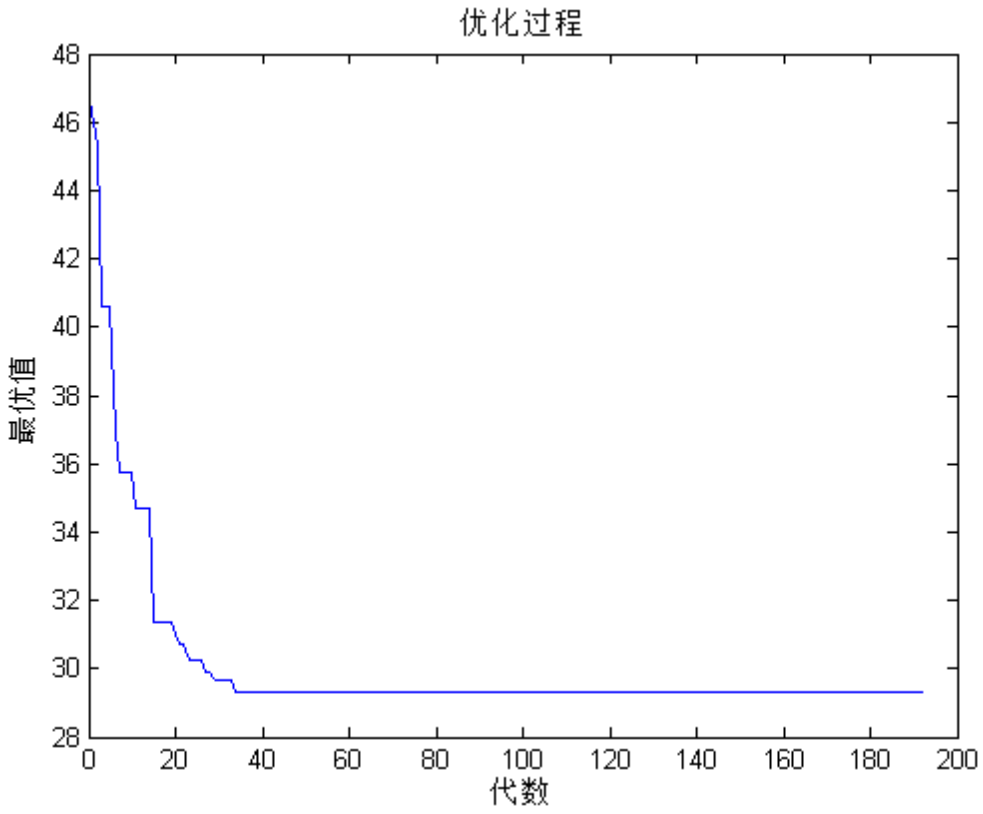

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

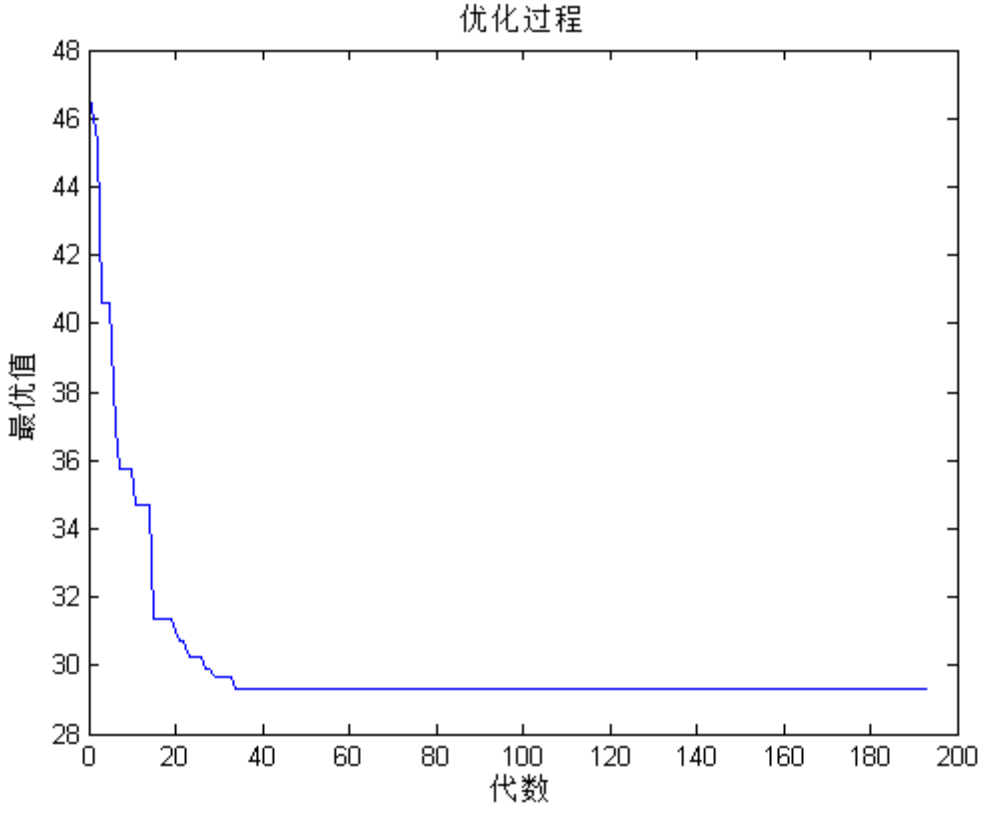

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

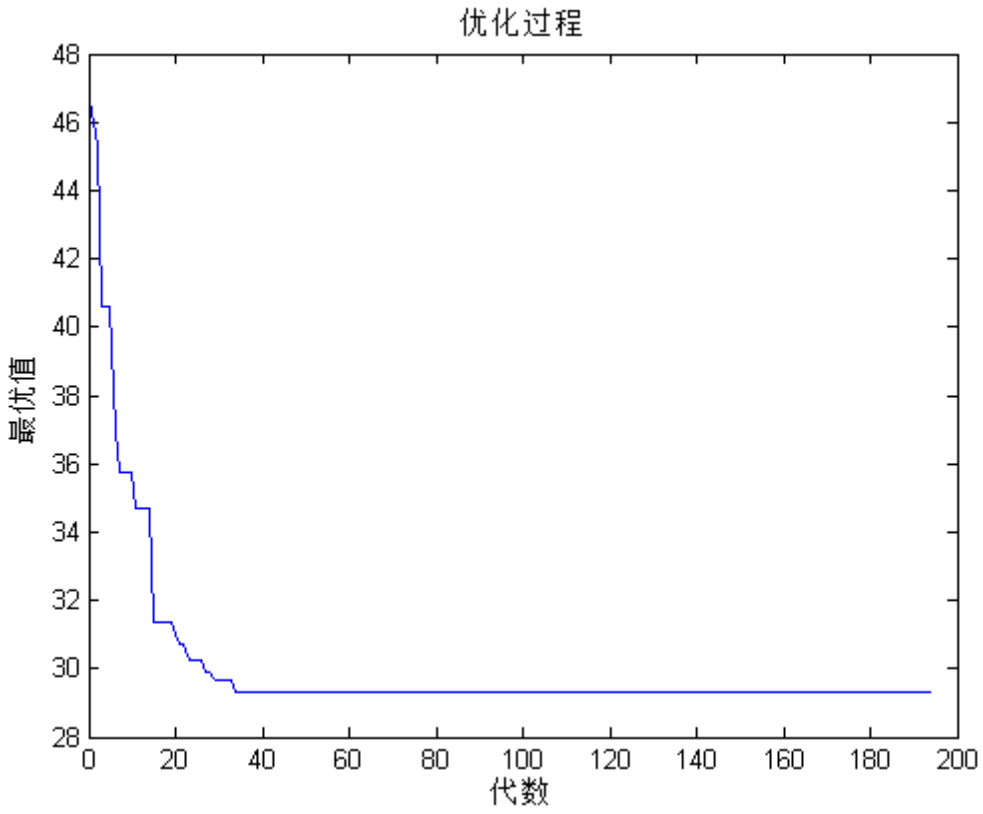

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

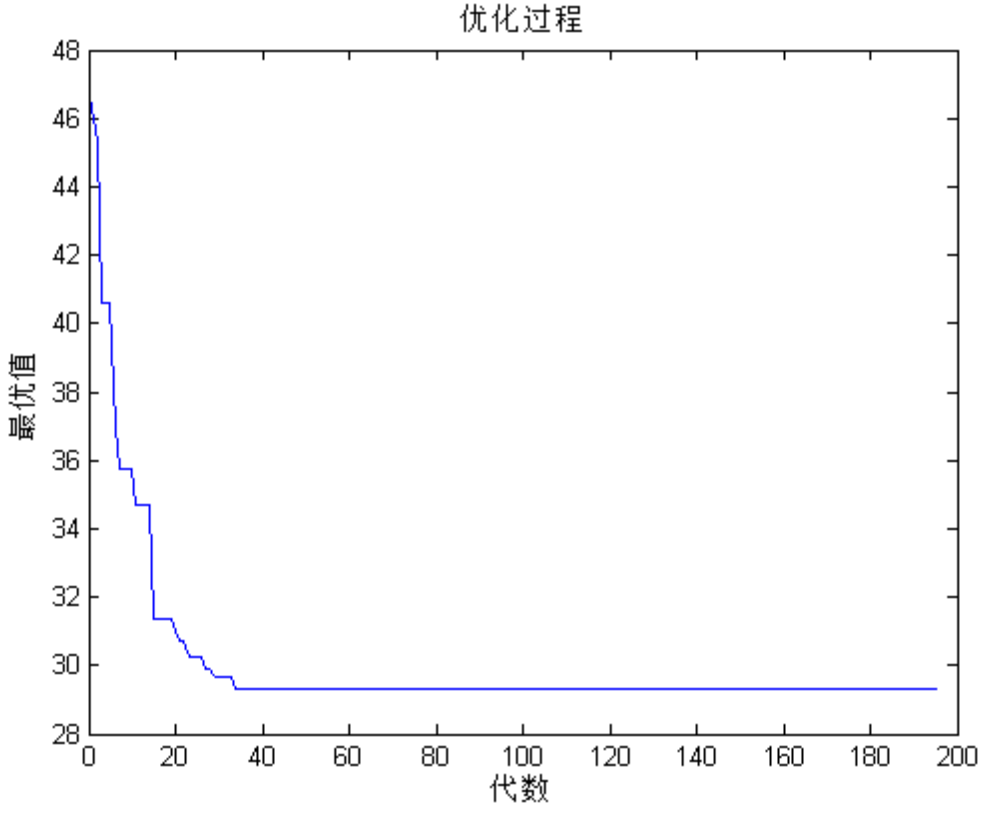

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

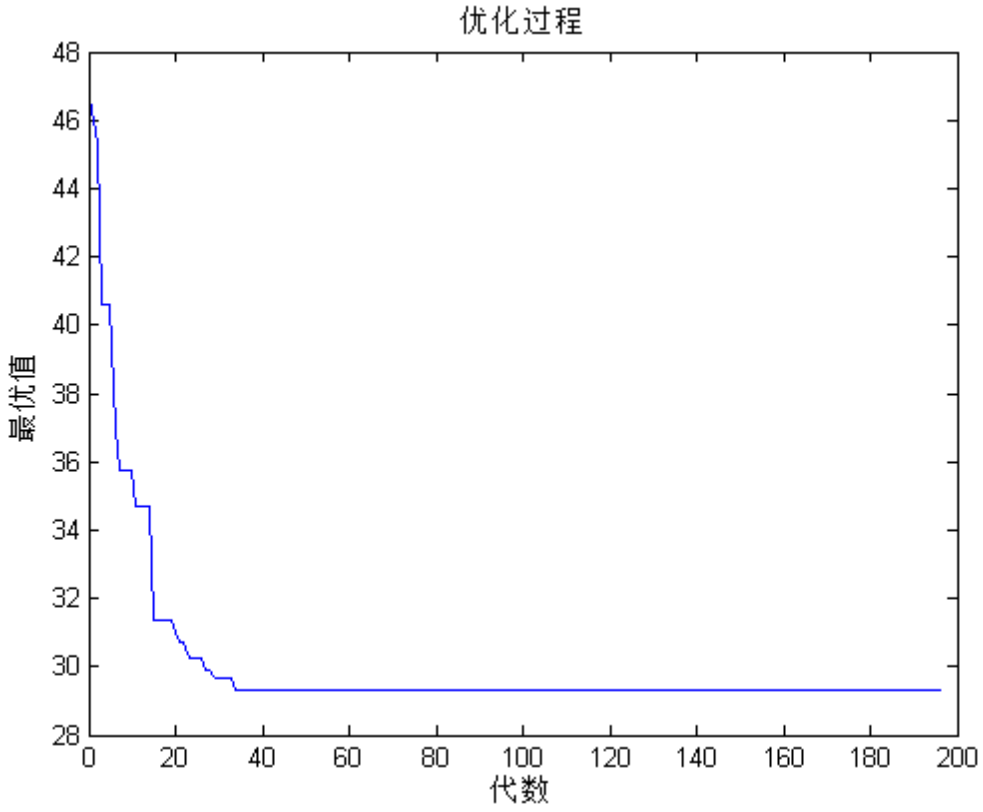

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

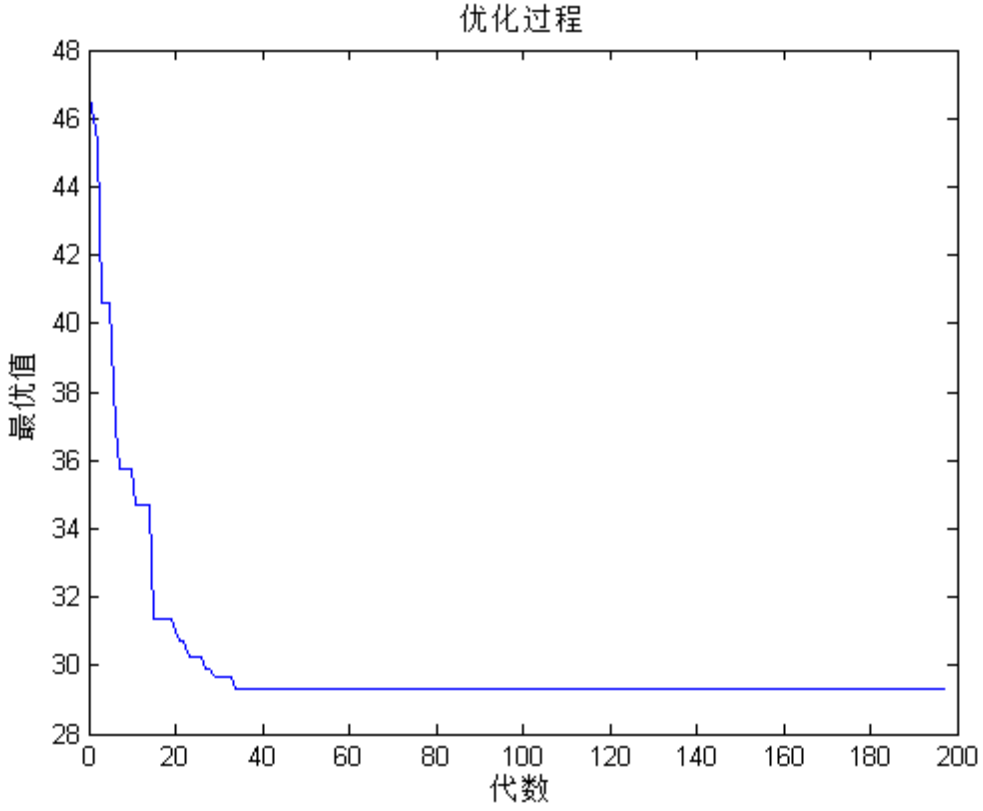

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

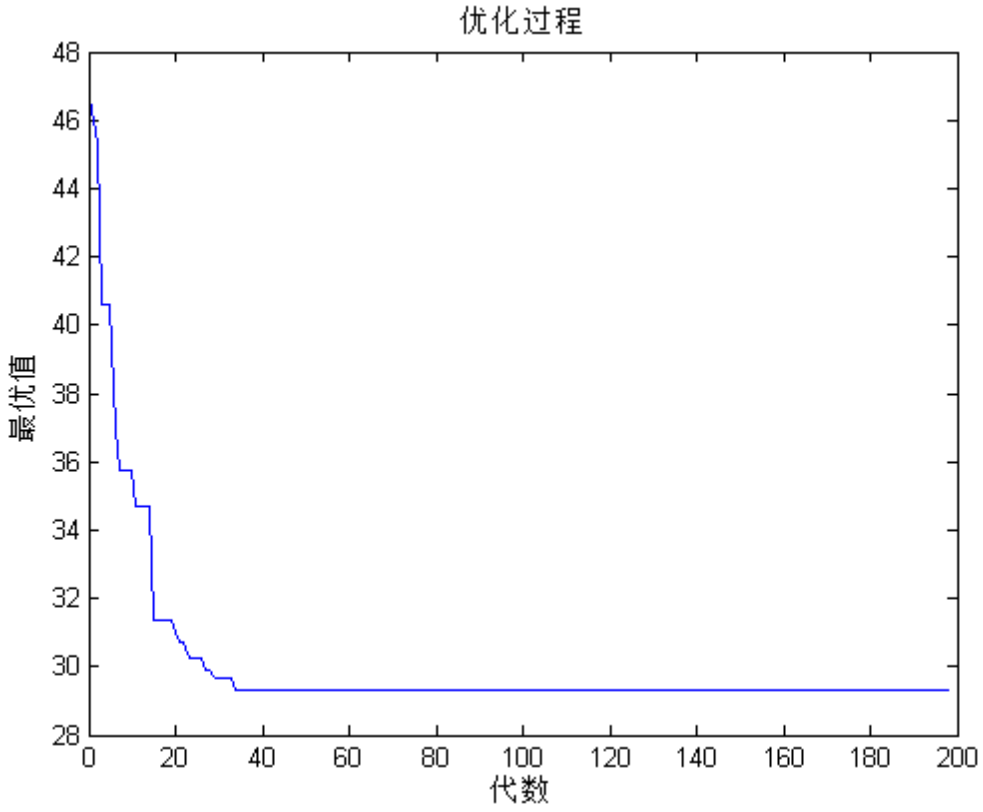

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200

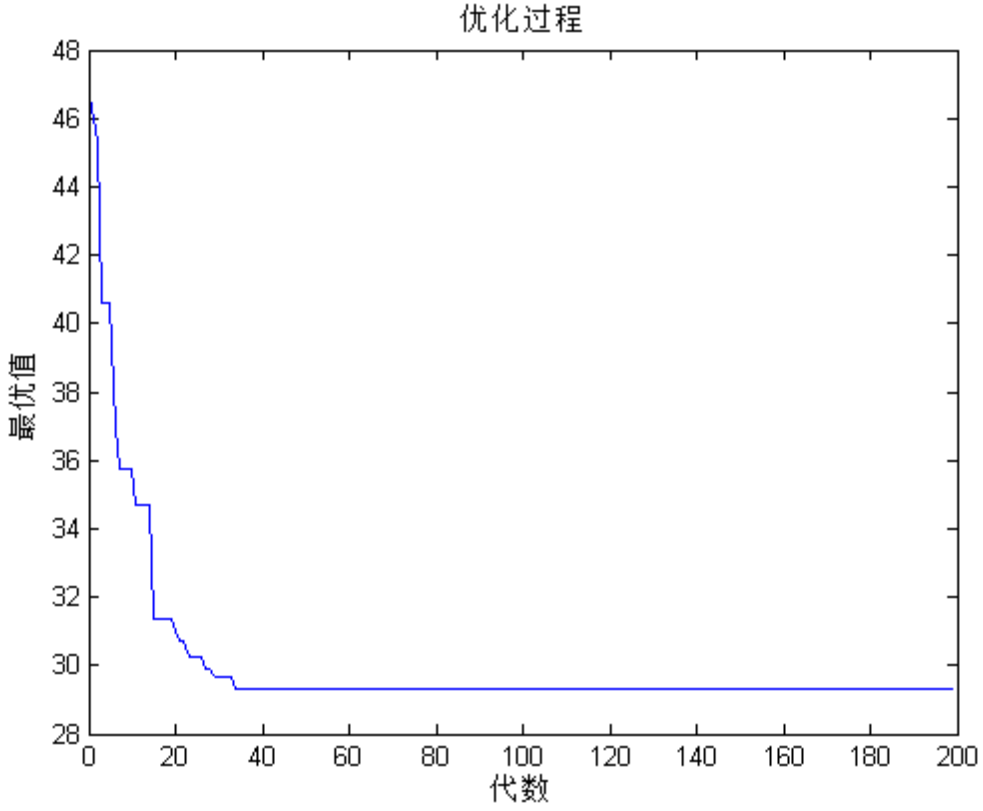

优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200


优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200


优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200


优化过程
最优值
代数
48
46
44
42
40
38
36
34
32
30
28
0
20
40
60
80
100
120
140
160
180
200





选择

```
SelCh=Select(Chrom,FitnV,GGAP);
```

交叉操作

```
SelCh=Recombin(SelCh,Pc);
```

变异

```
    SelCh=Mutate(SelCh,Pm);
```

逆转操作

```
    SelCh=Reverse(SelCh,D);
```

重插入子代的新种群

```
    Chrom=Reins(Chrom,SelCh,ObjV);
```

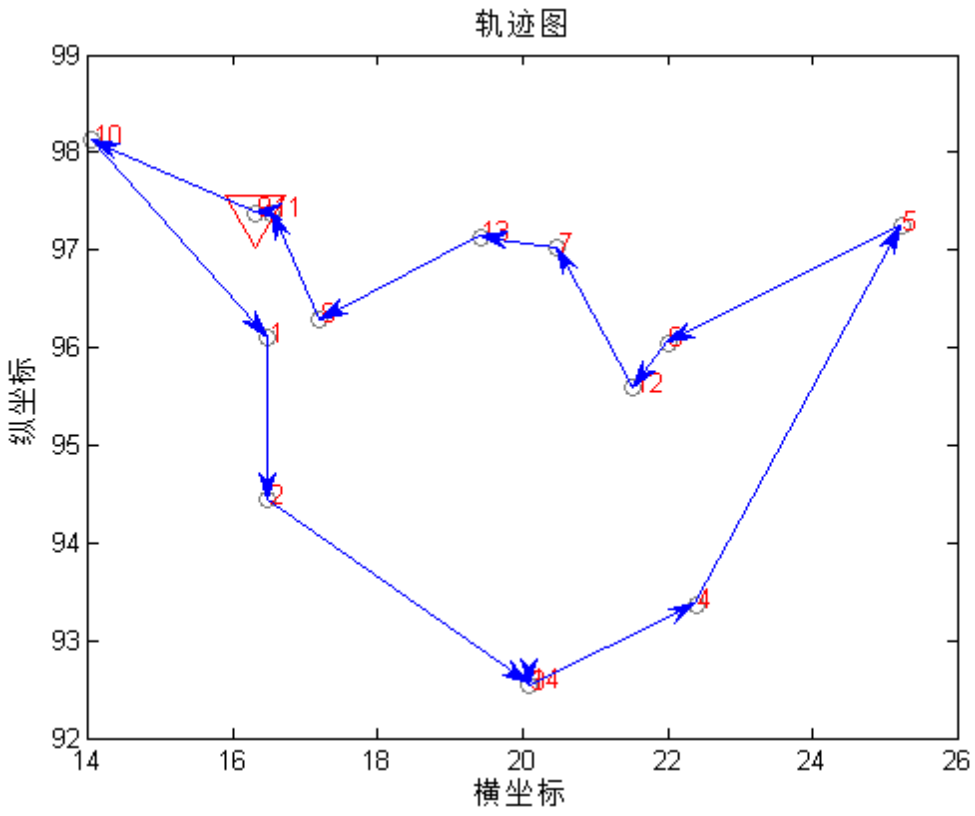
更新迭代次数

```
    gen=gen+1 ;
```

```
end
```

画出最优解的路线图

```
ObjV=PathLength(D,Chrom);  %计算路线长度
[minObjV,minInd]=min(ObjV);
DrawPath(Chrom(minInd(1),:),X)
```



输出最优解的路线和总距离

```
disp('最优解:')
p=OutputPath(Chrom(minInd(1),:));
```

```
disp(['总距离：',num2str(ObjV(minInd(1)))]);
disp('-----------------------------------------------------------')
```

```
最优解:
9—>10—>1—>2—>14—>3—>4—>5—>6—>12—>7—>13—>8—>11—>9
总距离：29.3405
-----------------------------------------------------------
```

Published with MATLAB® R2014a