```
1  "E:\1 □□□□\3 □□□□□\1 □□□□□□\1 □□□□□□□□\1_□□□□□□_□□□□\1_LW_□□□□□2\6 □□□□\2 python code\01_My_Python_Code\Scripts\python.
   exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=29648
2
3  import sys; print('Python %s on %s' % (sys.version, sys.platform))
4  sys.path.extend(['E:\\1 □□□□\\3 □□□□\\1 □□□□□□\\1 □□□□□□□□\\1_□□□□□□_□□□□\\1_LW_□□□□□2\\6 □□□□\\2 python code\\
   01_My_Python_Code', 'E:/1 □□□□/3 □□□□□/1 □□□□□□/1 □□□□□□□□/1_□□□□□□_□□□□/1_LW_□□□□□2/6 □□□□/2 python code/
   01_My_Python_Code'])
5
6  PyDev console: starting.
7
8  Python 3.9.7 (tags/v3.9.7:1016ef3, Aug 30 2021, 20:19:38) [MSC v.1929 64 bit (AMD64)] on win32
9  >>> runfile('E:/1 □□□□/3 □□□□□/1 □□□□□□/1 □□□□□□□□/1_□□□□□□_□□□□/1_LW_□□□□□2/6 □□□□/2 python code/01_My_Python_Code/
   main_BACASP_offical_PSO_2D_Bin_berth_line.py', wdir='E:/1 □□□□/3 □□□□□/1 □□□□□□/1 □□□□□□□□/1_□□□□□□_□□□□/1_LW_□□□□□2/6
   □□□□/2 python code/01_My_Python_Code')
10 Backend TkAgg is interactive backend. Turning interactive mode on.
11 Waiting 1s.....
12
13 This is the  R_6_1 _standerd_test.xlsx  optimization process.
14
15 Start
16    Read basic data
17       V = 6
18       T = 36
19       Q = 23
20       L = 30
21    PSO parameter setting:
22       maxIter_num =  20
23       W_inertia =  1.5
24       oder_type_num =  15
25       c1 =  1.0
26       c2 =  2.5
27       r1 =  0.6313541969956434
28       r2 =  0.6313541969956434
29 Begin iteration:
30
31 iter =  0
32       cord_individul_obj[indivial_i, :] =  [ 0.  6. 28. 34.]
33       cord_individul_obj[indivial_i, :] =  [ 1.  4. 76. 80.]
34       cord_individul_obj[indivial_i, :] =  [ 2.  6. 72. 78.]
35       cord_individul_obj[indivial_i, :] =  [ 3.   4. 104. 108.]
36       cord_individul_obj[indivial_i, :] =  [ 4.  5.  8. 13.]
37       cord_individul_obj[indivial_i, :] =  [ 5.  5. 20. 25.]
38       cord_individul_obj[indivial_i, :] =  [ 6.  5. 62. 67.]
39       cord_individul_obj[indivial_i, :] =  [ 7.  4. 60. 64.]
40       cord_individul_obj[indivial_i, :] =  [ 8.  5. 68. 73.]
41       cord_individul_obj[indivial_i, :] =  [ 9.  4. 32. 36.]
42       cord_individul_obj[indivial_i, :] =  [10.  6. 12. 18.]
43       cord_individul_obj[indivial_i, :] =  [11.  4. 24. 28.]
44       cord_individul_obj[indivial_i, :] =  [12.  5. 12. 17.]
45       cord_individul_obj[indivial_i, :] =  [13.  4. 24. 28.]
46       cord_individul_obj[indivial_i, :] =  [14.  4. 94. 98.]
47
48    min(cord_individul_obj[:, 3]) =  13.0
49    historl_G_best_iter[iter, 3] =  13.0
50 Begin iteration:
51
52 iter =  1
53       cord_individul_obj[indivial_i, :] =  [ 0.  9. 12. 21.]
54       cord_individul_obj[indivial_i, :] =  [ 1.  9.  4. 13.]
55       cord_individul_obj[indivial_i, :] =  [ 2.  6. 12. 18.]
56       cord_individul_obj[indivial_i, :] =  [ 3.  5.  8. 13.]
57       cord_individul_obj[indivial_i, :] =  [ 4.  6. 48. 54.]
58       cord_individul_obj[indivial_i, :] =  [ 5.  9. 36. 45.]
59       cord_individul_obj[indivial_i, :] =  [ 6. 10. 12. 22.]
60       cord_individul_obj[indivial_i, :] =  [ 7.  9. 14. 23.]
61       cord_individul_obj[indivial_i, :] =  [ 8.  9. 12. 21.]
62       cord_individul_obj[indivial_i, :] =  [ 9.  6. 12. 18.]
63       cord_individul_obj[indivial_i, :] =  [10.  5. 18. 23.]
64       cord_individul_obj[indivial_i, :] =  [11. 12.  4. 16.]
65       cord_individul_obj[indivial_i, :] =  [12.  6. 40. 46.]
66       cord_individul_obj[indivial_i, :] =  [13. 12.  4. 16.]
67       cord_individul_obj[indivial_i, :] =  [14. 10. 12. 22.]
68
69    min(cord_individul_obj[:, 3]) =  13.0
70    historl_G_best_iter[iter, 3] =  13.0
71 Begin iteration:
72
73 iter =  2
74       cord_individul_obj[indivial_i, :] =  [ 0. 12. 102. 114.]
75       cord_individul_obj[indivial_i, :] =  [1. 4. 4. 8.]
76       cord_individul_obj[indivial_i, :] =  [ 2. 12.  2. 14.]
77       cord_individul_obj[indivial_i, :] =  [ 3. 10. 24. 34.]
78       cord_individul_obj[indivial_i, :] =  [ 4.  9.  4. 13.]
79       cord_individul_obj[indivial_i, :] =  [ 5.  4. 18. 22.]
```

```
 80        cord_individul_obj[indivial_i, :] = [ 6. 10. 34. 44.]
 81        cord_individul_obj[indivial_i, :] = [ 7. 10.  8. 18.]
 82        cord_individul_obj[indivial_i, :] = [ 8.  4. 30. 34.]
 83        cord_individul_obj[indivial_i, :] = [ 9.  6. 32. 38.]
 84        cord_individul_obj[indivial_i, :] = [10.  9. 66. 75.]
 85        cord_individul_obj[indivial_i, :] = [11.  5. 18. 23.]
 86        cord_individul_obj[indivial_i, :] = [12. 10. 52. 62.]
 87        cord_individul_obj[indivial_i, :] = [13. 12.  2. 14.]
 88        cord_individul_obj[indivial_i, :] = [14. 10. 24. 34.]
 89
 90     min(cord_individul_obj[:, 3]) = 8.0
 91     historl_G_best_iter[iter, 3] = 8.0
 92  Begin iteration:
 93
 94  iter = 3
 95        cord_individul_obj[indivial_i, :] = [0. 4. 4. 8.]
 96        cord_individul_obj[indivial_i, :] = [ 1.  9. 18. 27.]
 97        cord_individul_obj[indivial_i, :] = [ 2. 12.  2. 14.]
 98        cord_individul_obj[indivial_i, :] = [ 3.  9.  8. 17.]
 99        cord_individul_obj[indivial_i, :] = [ 4.  6.  8. 14.]
100        cord_individul_obj[indivial_i, :] = [ 5.  9. 18. 27.]
101        cord_individul_obj[indivial_i, :] = [ 6.  4. 32. 36.]
102        cord_individul_obj[indivial_i, :] = [ 7.  9.  8. 17.]
103        cord_individul_obj[indivial_i, :] = [ 8.  5. 18. 23.]
104        cord_individul_obj[indivial_i, :] = [ 9. 10. 32. 42.]
105        cord_individul_obj[indivial_i, :] = [10.  5. 18. 23.]
106        cord_individul_obj[indivial_i, :] = [11. 12.  2. 14.]
107        cord_individul_obj[indivial_i, :] = [12.  5. 18. 23.]
108        cord_individul_obj[indivial_i, :] = [13. 12.  2. 14.]
109        cord_individul_obj[indivial_i, :] = [14.  6.  8. 14.]
110
111     min(cord_individul_obj[:, 3]) = 8.0
112     historl_G_best_iter[iter, 3] = 8.0
113  Begin iteration:
114
115  iter = 4
116        cord_individul_obj[indivial_i, :] = [ 0. 12.  2. 14.]
117        cord_individul_obj[indivial_i, :] = [ 1.  9. 18. 27.]
118        cord_individul_obj[indivial_i, :] = [ 2.  4. 18. 22.]
119        cord_individul_obj[indivial_i, :] = [ 3.  4. 66. 70.]
120        cord_individul_obj[indivial_i, :] = [ 4.  4. 24. 28.]
121        cord_individul_obj[indivial_i, :] = [ 5.  4. 18. 22.]
122        cord_individul_obj[indivial_i, :] = [ 6.  9.  8. 17.]
123        cord_individul_obj[indivial_i, :] = [7. 5. 2. 7.]
124        cord_individul_obj[indivial_i, :] = [ 8.  4. 18. 22.]
125        cord_individul_obj[indivial_i, :] = [9. 4. 4. 8.]
126        cord_individul_obj[indivial_i, :] = [10.  4. 18. 22.]
127        cord_individul_obj[indivial_i, :] = [11.  4. 18. 22.]
128        cord_individul_obj[indivial_i, :] = [12.  4. 18. 22.]
129        cord_individul_obj[indivial_i, :] = [13.  4. 18. 22.]
130        cord_individul_obj[indivial_i, :] = [14.  4. 26. 30.]
131
132     min(cord_individul_obj[:, 3]) = 7.0
133     historl_G_best_iter[iter, 3] = 7.0
134  Begin iteration:
135
136  iter = 5
137        cord_individul_obj[indivial_i, :] = [ 0.  4. 18. 22.]
138        cord_individul_obj[indivial_i, :] = [ 1.  5. 38. 43.]
139        cord_individul_obj[indivial_i, :] = [ 2. 12.  4. 16.]
140        cord_individul_obj[indivial_i, :] = [3. 5. 2. 7.]
141        cord_individul_obj[indivial_i, :] = [ 4.  6. 24. 30.]
142        cord_individul_obj[indivial_i, :] = [ 5.  9. 18. 27.]
143        cord_individul_obj[indivial_i, :] = [ 6.  9. 20. 29.]
144        cord_individul_obj[indivial_i, :] = [ 7.  9. 12. 21.]
145        cord_individul_obj[indivial_i, :] = [ 8.  4. 18. 22.]
146        cord_individul_obj[indivial_i, :] = [ 9.  9. 12. 21.]
147        cord_individul_obj[indivial_i, :] = [10.  4. 18. 22.]
148        cord_individul_obj[indivial_i, :] = [11. 12.  2. 14.]
149        cord_individul_obj[indivial_i, :] = [12.  9.  4. 13.]
150        cord_individul_obj[indivial_i, :] = [13. 12. 12. 24.]
151        cord_individul_obj[indivial_i, :] = [14.  6. 16. 22.]
152
153     min(cord_individul_obj[:, 3]) = 7.0
154     historl_G_best_iter[iter, 3] = 7.0
155  Begin iteration:
156
157  iter = 6
158        cord_individul_obj[indivial_i, :] = [ 0. 12. 14. 26.]
159        cord_individul_obj[indivial_i, :] = [1. 5. 2. 7.]
160        cord_individul_obj[indivial_i, :] = [ 2. 12.  4. 16.]
161        cord_individul_obj[indivial_i, :] = [ 3.  9.  4. 13.]
162        cord_individul_obj[indivial_i, :] = [ 4.  5. 12. 17.]
163        cord_individul_obj[indivial_i, :] = [ 5.  9. 18. 27.]
```

```
164        cord_individul_obj[indivial_i, :] = [ 6.  5. 36. 41.]
165        cord_individul_obj[indivial_i, :] = [ 7.  9.  4. 13.]
166        cord_individul_obj[indivial_i, :] = [ 8.  4. 18. 22.]
167        cord_individul_obj[indivial_i, :] = [ 9. 10. 12. 22.]
168        cord_individul_obj[indivial_i, :] = [10.  4. 18. 22.]
169        cord_individul_obj[indivial_i, :] = [11. 12.  2. 14.]
170        cord_individul_obj[indivial_i, :] = [12.  5. 12. 17.]
171        cord_individul_obj[indivial_i, :] = [13. 12.  2. 14.]
172        cord_individul_obj[indivial_i, :] = [14.  6. 74. 80.]
173
174     min(cord_individul_obj[:, 3]) =  7.0
175     historl_G_best_iter[iter, 3] =  7.0
176  Begin iteration:
177
178  iter =  7
179        cord_individul_obj[indivial_i, :] = [ 0.  5. 28. 33.]
180        cord_individul_obj[indivial_i, :] = [ 1.  9. 30. 39.]
181        cord_individul_obj[indivial_i, :] = [ 2.  3. 62. 65.]
182        cord_individul_obj[indivial_i, :] = [ 3. 12.  4. 16.]
183        cord_individul_obj[indivial_i, :] = [ 4.  6.  8. 14.]
184        cord_individul_obj[indivial_i, :] = [ 5.  5. 18. 23.]
185        cord_individul_obj[indivial_i, :] = [6. 5. 2. 7.]
186        cord_individul_obj[indivial_i, :] = [ 7. 12.  4. 16.]
187        cord_individul_obj[indivial_i, :] = [ 8.  9. 54. 63.]
188        cord_individul_obj[indivial_i, :] = [ 9. 12.  2. 14.]
189        cord_individul_obj[indivial_i, :] = [10.  4. 14. 18.]
190        cord_individul_obj[indivial_i, :] = [11.  9. 80. 89.]
191        cord_individul_obj[indivial_i, :] = [12.  4. 38. 42.]
192        cord_individul_obj[indivial_i, :] = [13.  4. 26. 30.]
193        cord_individul_obj[indivial_i, :] = [14.  5.  2.  7.]
194
195     min(cord_individul_obj[:, 3]) =  7.0
196     historl_G_best_iter[iter, 3] =  7.0
197  Begin iteration:
198
199  iter =  8
200        cord_individul_obj[indivial_i, :] = [ 0. 10. 44. 54.]
201        cord_individul_obj[indivial_i, :] = [ 1. 10.  8. 18.]
202        cord_individul_obj[indivial_i, :] = [ 2.  5. 56. 61.]
203        cord_individul_obj[indivial_i, :] = [ 3. 10. 74. 84.]
204        cord_individul_obj[indivial_i, :] = [ 4.  5. 18. 23.]
205        cord_individul_obj[indivial_i, :] = [ 5.  5. 26. 31.]
206        cord_individul_obj[indivial_i, :] = [ 6. 10. 74. 84.]
207        cord_individul_obj[indivial_i, :] = [ 7.  9. 144. 153.]
208        cord_individul_obj[indivial_i, :] = [ 8. 12.  2. 14.]
209        cord_individul_obj[indivial_i, :] = [ 9.  3. 56. 59.]
210        cord_individul_obj[indivial_i, :] = [10. 10. 12. 22.]
211        cord_individul_obj[indivial_i, :] = [11.  5.  2.  7.]
212        cord_individul_obj[indivial_i, :] = [12.  9. 38. 47.]
213        cord_individul_obj[indivial_i, :] = [ 13.  9. 102. 111.]
214        cord_individul_obj[indivial_i, :] = [14. 10. 20. 30.]
215
216     min(cord_individul_obj[:, 3]) =  7.0
217     historl_G_best_iter[iter, 3] =  7.0
218  Begin iteration:
219
220  iter =  9
221        cord_individul_obj[indivial_i, :] = [ 0.  9. 12. 21.]
222        cord_individul_obj[indivial_i, :] = [ 1.  9. 116. 125.]
223        cord_individul_obj[indivial_i, :] = [ 2.  5. 60. 65.]
224        cord_individul_obj[indivial_i, :] = [ 3.  9. 32. 41.]
225        cord_individul_obj[indivial_i, :] = [4. 5. 4. 9.]
226        cord_individul_obj[indivial_i, :] = [ 5.  9. 50. 59.]
227        cord_individul_obj[indivial_i, :] = [ 6. 10. 74. 84.]
228        cord_individul_obj[indivial_i, :] = [7. 5. 2. 7.]
229        cord_individul_obj[indivial_i, :] = [ 8.  5. 54. 59.]
230        cord_individul_obj[indivial_i, :] = [ 9.  5. 32. 37.]
231        cord_individul_obj[indivial_i, :] = [10.  5. 32. 37.]
232        cord_individul_obj[indivial_i, :] = [11.  5. 18. 23.]
233        cord_individul_obj[indivial_i, :] = [12.  5. 54. 59.]
234        cord_individul_obj[indivial_i, :] = [13.  9. 54. 63.]
235        cord_individul_obj[indivial_i, :] = [14. 10. 32. 42.]
236
237     min(cord_individul_obj[:, 3]) =  7.0
238     historl_G_best_iter[iter, 3] =  7.0
239  Begin iteration:
240
241  iter =  10
242        cord_individul_obj[indivial_i, :] = [ 0.  9.  8. 17.]
243        cord_individul_obj[indivial_i, :] = [1. 5. 2. 7.]
244        cord_individul_obj[indivial_i, :] = [ 2.  9.  8. 17.]
245        cord_individul_obj[indivial_i, :] = [ 3. 10. 38. 48.]
246        cord_individul_obj[indivial_i, :] = [ 4.  5. 32. 37.]
247        cord_individul_obj[indivial_i, :] = [ 5.  5. 82. 87.]
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```
248        cord_individul_obj[indivial_i, :] = [ 6.  5. 74. 79.]
249        cord_individul_obj[indivial_i, :] = [ 7. 10. 40. 50.]
250        cord_individul_obj[indivial_i, :] = [ 8.  9. 78. 87.]
251        cord_individul_obj[indivial_i, :] = [ 9.  9. 116. 125.]
252        cord_individul_obj[indivial_i, :] = [10.  4. 38. 42.]
253        cord_individul_obj[indivial_i, :] = [11.  6.  8. 14.]
254        cord_individul_obj[indivial_i, :] = [12.  9. 50. 59.]
255        cord_individul_obj[indivial_i, :] = [13.  9.  8. 17.]
256        cord_individul_obj[indivial_i, :] = [14.  5. 32. 37.]
257
258     min(cord_individul_obj[:, 3]) =  7.0
259     historl_G_best_iter[iter, 3] =  7.0
260  Begin iteration:
261
262  iter =  11
263        cord_individul_obj[indivial_i, :] = [ 0.  5. 92. 97.]
264        cord_individul_obj[indivial_i, :] = [ 1.  9. 50. 59.]
265        cord_individul_obj[indivial_i, :] = [ 2.  9. 172. 181.]
266        cord_individul_obj[indivial_i, :] = [ 3. 10. 80. 90.]
267        cord_individul_obj[indivial_i, :] = [ 4.  5. 54. 59.]
268        cord_individul_obj[indivial_i, :] = [ 5.  9. 68. 77.]
269        cord_individul_obj[indivial_i, :] = [ 6. 10. 50. 60.]
270        cord_individul_obj[indivial_i, :] = [ 7. 10. 82. 92.]
271        cord_individul_obj[indivial_i, :] = [ 8.  9. 120. 129.]
272        cord_individul_obj[indivial_i, :] = [9. 5. 2. 7.]
273        cord_individul_obj[indivial_i, :] = [10.  5. 82. 87.]
274        cord_individul_obj[indivial_i, :] = [ 11.   5. 110. 115.]
275        cord_individul_obj[indivial_i, :] = [12.  9. 62. 71.]
276        cord_individul_obj[indivial_i, :] = [ 13.  5. 186. 191.]
277        cord_individul_obj[indivial_i, :] = [14.  5. 70. 75.]
278
279     min(cord_individul_obj[:, 3]) =  7.0
280     historl_G_best_iter[iter, 3] =  7.0
281  Begin iteration:
282
283  iter =  12
284        cord_individul_obj[indivial_i, :] = [ 0.  9. 24. 33.]
285        cord_individul_obj[indivial_i, :] = [ 1.  4. 36. 40.]
286        cord_individul_obj[indivial_i, :] = [ 2.  9.  8. 17.]
287        cord_individul_obj[indivial_i, :] = [ 3. 10.  8. 18.]
288        cord_individul_obj[indivial_i, :] = [4. 5. 4. 9.]
289        cord_individul_obj[indivial_i, :] = [ 5.  9. 50. 59.]
290        cord_individul_obj[indivial_i, :] = [ 6.  9. 74. 83.]
291        cord_individul_obj[indivial_i, :] = [ 7.  9. 28. 37.]
292        cord_individul_obj[indivial_i, :] = [ 8.  5. 50. 55.]
293        cord_individul_obj[indivial_i, :] = [ 9.  3. 90. 93.]
294        cord_individul_obj[indivial_i, :] = [10.  5. 50. 55.]
295        cord_individul_obj[indivial_i, :] = [11.  5. 60. 65.]
296        cord_individul_obj[indivial_i, :] = [12. 10.  2. 12.]
297        cord_individul_obj[indivial_i, :] = [13.  5.  2.  7.]
298        cord_individul_obj[indivial_i, :] = [14. 10. 56. 66.]
299
300     min(cord_individul_obj[:, 3]) =  7.0
301     historl_G_best_iter[iter, 3] =  7.0
302  Begin iteration:
303
304  iter =  13
305        cord_individul_obj[indivial_i, :] = [0. 5. 2. 7.]
306        cord_individul_obj[indivial_i, :] = [ 1.  9. 88. 97.]
307        cord_individul_obj[indivial_i, :] = [ 2.  5. 54. 59.]
308        cord_individul_obj[indivial_i, :] = [ 3. 10. 108. 118.]
309        cord_individul_obj[indivial_i, :] = [ 4.  9. 100. 109.]
310        cord_individul_obj[indivial_i, :] = [ 5.  5. 50. 55.]
311        cord_individul_obj[indivial_i, :] = [ 6.  9. 32. 41.]
312        cord_individul_obj[indivial_i, :] = [ 7. 10. 134. 144.]
313        cord_individul_obj[indivial_i, :] = [ 8.  5. 82. 87.]
314        cord_individul_obj[indivial_i, :] = [9. 5. 2. 7.]
315        cord_individul_obj[indivial_i, :] = [ 10.   5. 106. 111.]
316        cord_individul_obj[indivial_i, :] = [11.  9. 64. 73.]
317        cord_individul_obj[indivial_i, :] = [ 12.  9. 122. 131.]
318        cord_individul_obj[indivial_i, :] = [13.  9. 38. 47.]
319        cord_individul_obj[indivial_i, :] = [14.  5. 24. 29.]
320
321     min(cord_individul_obj[:, 3]) =  7.0
322     historl_G_best_iter[iter, 3] =  7.0
323  Begin iteration:
324
325  iter =  14
326        cord_individul_obj[indivial_i, :] = [ 0.  9. 28. 37.]
327        cord_individul_obj[indivial_i, :] = [ 1.  9. 12. 21.]
328        cord_individul_obj[indivial_i, :] = [2. 5. 4. 9.]
329        cord_individul_obj[indivial_i, :] = [ 3.  9. 36. 45.]
330        cord_individul_obj[indivial_i, :] = [ 4.  5. 12. 17.]
331        cord_individul_obj[indivial_i, :] = [ 5.  9. 68. 77.]
```

```
332        cord_individul_obj[indivial_i, :] = [ 6.  10. 124. 134.]
333        cord_individul_obj[indivial_i, :] = [7. 5. 2. 7.]
334        cord_individul_obj[indivial_i, :] = [ 8.  5. 58. 63.]
335        cord_individul_obj[indivial_i, :] = [ 9.  9. 12. 21.]
336        cord_individul_obj[indivial_i, :] = [10.  4. 46. 50.]
337        cord_individul_obj[indivial_i, :] = [11.  5. 18. 23.]
338        cord_individul_obj[indivial_i, :] = [12.  9. 78. 87.]
339        cord_individul_obj[indivial_i, :] = [13.  5. 12. 17.]
340        cord_individul_obj[indivial_i, :] = [14. 10.  4. 14.]
341
342     min(cord_individul_obj[:, 3]) =  7.0
343     historl_G_best_iter[iter, 3] =  7.0
344  Begin iteration:
345
346  iter =  15
347        cord_individul_obj[indivial_i, :] = [ 0.  9. 28. 37.]
348        cord_individul_obj[indivial_i, :] = [ 1.  9. 46. 55.]
349        cord_individul_obj[indivial_i, :] = [ 2.  9. 18. 27.]
350        cord_individul_obj[indivial_i, :] = [ 3. 10. 36. 46.]
351        cord_individul_obj[indivial_i, :] = [ 4.  5. 18. 23.]
352        cord_individul_obj[indivial_i, :] = [ 5.  9. 46. 55.]
353        cord_individul_obj[indivial_i, :] = [6. 5. 2. 7.]
354        cord_individul_obj[indivial_i, :] = [ 7.  9. 28. 37.]
355        cord_individul_obj[indivial_i, :] = [ 8.  5. 58. 63.]
356        cord_individul_obj[indivial_i, :] = [ 9.  9. 18. 27.]
357        cord_individul_obj[indivial_i, :] = [10.  5. 46. 51.]
358        cord_individul_obj[indivial_i, :] = [11.  5. 40. 45.]
359        cord_individul_obj[indivial_i, :] = [12.  9. 46. 55.]
360        cord_individul_obj[indivial_i, :] = [13.  9. 18. 27.]
361        cord_individul_obj[indivial_i, :] = [14. 10. 18. 28.]
362
363     min(cord_individul_obj[:, 3]) =  7.0
364     historl_G_best_iter[iter, 3] =  7.0
365  Begin iteration:
366
367  iter =  16
368        cord_individul_obj[indivial_i, :] = [ 0.  5. 84. 89.]
369        cord_individul_obj[indivial_i, :] = [ 1.  4. 12. 16.]
370        cord_individul_obj[indivial_i, :] = [ 2.  5. 32. 37.]
371        cord_individul_obj[indivial_i, :] = [ 3. 10. 40. 50.]
372        cord_individul_obj[indivial_i, :] = [ 4.  5. 60. 65.]
373        cord_individul_obj[indivial_i, :] = [ 5.  5. 52. 57.]
374        cord_individul_obj[indivial_i, :] = [ 6.  10. 158. 168.]
375        cord_individul_obj[indivial_i, :] = [ 7. 10. 56. 66.]
376        cord_individul_obj[indivial_i, :] = [8. 5. 2. 7.]
377        cord_individul_obj[indivial_i, :] = [ 9.  4. 34. 38.]
378        cord_individul_obj[indivial_i, :] = [10.  5. 42. 47.]
379        cord_individul_obj[indivial_i, :] = [11.  5. 54. 59.]
380        cord_individul_obj[indivial_i, :] = [12.  9. 84. 93.]
381        cord_individul_obj[indivial_i, :] = [13.  5. 28. 33.]
382        cord_individul_obj[indivial_i, :] = [14.  5. 36. 41.]
383
384     min(cord_individul_obj[:, 3]) =  7.0
385     historl_G_best_iter[iter, 3] =  7.0
386  Begin iteration:
387
388  iter =  17
389        cord_individul_obj[indivial_i, :] = [ 0.  9. 28. 37.]
390        cord_individul_obj[indivial_i, :] = [ 1.  9. 36. 45.]
391        cord_individul_obj[indivial_i, :] = [ 2.  5. 18. 23.]
392        cord_individul_obj[indivial_i, :] = [ 3. 10. 40. 50.]
393        cord_individul_obj[indivial_i, :] = [ 4.  5. 28. 33.]
394        cord_individul_obj[indivial_i, :] = [ 5.  9. 58. 67.]
395        cord_individul_obj[indivial_i, :] = [6. 5. 2. 7.]
396        cord_individul_obj[indivial_i, :] = [ 7. 10. 18. 28.]
397        cord_individul_obj[indivial_i, :] = [ 8.  5. 66. 71.]
398        cord_individul_obj[indivial_i, :] = [ 9.  5. 32. 37.]
399        cord_individul_obj[indivial_i, :] = [10.  5. 60. 65.]
400        cord_individul_obj[indivial_i, :] = [11.  5. 40. 45.]
401        cord_individul_obj[indivial_i, :] = [12.  9. 36. 45.]
402        cord_individul_obj[indivial_i, :] = [13.  9. 12. 21.]
403        cord_individul_obj[indivial_i, :] = [14. 10.  4. 14.]
404
405     min(cord_individul_obj[:, 3]) =  7.0
406     historl_G_best_iter[iter, 3] =  7.0
407  Begin iteration:
408
409  iter =  18
410        cord_individul_obj[indivial_i, :] = [ 0.  9. 28. 37.]
411        cord_individul_obj[indivial_i, :] = [ 1.  9. 12. 21.]
412        cord_individul_obj[indivial_i, :] = [ 2.  9.  4. 13.]
413        cord_individul_obj[indivial_i, :] = [ 3.  9. 36. 45.]
414        cord_individul_obj[indivial_i, :] = [ 4.  5. 12. 17.]
415        cord_individul_obj[indivial_i, :] = [ 5.  9. 70. 79.]
```

```
416        cord_individul_obj[indivial_i, :] = [ 6.  10. 144. 154.]
417        cord_individul_obj[indivial_i, :] = [ 7.  9. 28. 37.]
418        cord_individul_obj[indivial_i, :] = [8. 5. 2. 7.]
419        cord_individul_obj[indivial_i, :] = [ 9.  9. 12. 21.]
420        cord_individul_obj[indivial_i, :] = [10.  4. 40. 44.]
421        cord_individul_obj[indivial_i, :] = [11.  5. 18. 23.]
422        cord_individul_obj[indivial_i, :] = [12.  9. 78. 87.]
423        cord_individul_obj[indivial_i, :] = [13.  9. 12. 21.]
424        cord_individul_obj[indivial_i, :] = [14. 10. 16. 26.]
425
426    min(cord_individul_obj[:, 3]) =  7.0
427    historl_G_best_iter[iter, 3] =  7.0
428 Begin iteration:
429
430 iter =  19
431        cord_individul_obj[indivial_i, :] = [ 0.  5. 38. 43.]
432        cord_individul_obj[indivial_i, :] = [ 1.  9. 46. 55.]
433        cord_individul_obj[indivial_i, :] = [ 2.  9. 18. 27.]
434        cord_individul_obj[indivial_i, :] = [ 3.  4. 36. 40.]
435        cord_individul_obj[indivial_i, :] = [ 4.  5. 18. 23.]
436        cord_individul_obj[indivial_i, :] = [ 5.  5. 46. 51.]
437        cord_individul_obj[indivial_i, :] = [6. 5. 2. 7.]
438        cord_individul_obj[indivial_i, :] = [ 7.  4. 40. 44.]
439        cord_individul_obj[indivial_i, :] = [ 8.  5. 66. 71.]
440        cord_individul_obj[indivial_i, :] = [ 9.  9. 36. 45.]
441        cord_individul_obj[indivial_i, :] = [10.  5. 44. 49.]
442        cord_individul_obj[indivial_i, :] = [11.  5. 40. 45.]
443        cord_individul_obj[indivial_i, :] = [12.  9. 46. 55.]
444        cord_individul_obj[indivial_i, :] = [13.  5. 46. 51.]
445        cord_individul_obj[indivial_i, :] = [14.  5. 36. 41.]
446
447    min(cord_individul_obj[:, 3]) =  7.0
448    historl_G_best_iter[iter, 3] =  7.0
449 Begin iteration:
450
451 iter =  20
452        cord_individul_obj[indivial_i, :] = [ 0.  9. 48. 57.]
453        cord_individul_obj[indivial_i, :] = [ 1.  9. 12. 21.]
454        cord_individul_obj[indivial_i, :] = [ 2.  9. 18. 27.]
455        cord_individul_obj[indivial_i, :] = [ 3.  9. 36. 45.]
456        cord_individul_obj[indivial_i, :] = [ 4.  5. 48. 53.]
457        cord_individul_obj[indivial_i, :] = [ 5.  9. 52. 61.]
458        cord_individul_obj[indivial_i, :] = [ 6.  10. 136. 146.]
459        cord_individul_obj[indivial_i, :] = [ 7.  9. 18. 27.]
460        cord_individul_obj[indivial_i, :] = [8. 5. 2. 7.]
461        cord_individul_obj[indivial_i, :] = [ 9.  9. 12. 21.]
462        cord_individul_obj[indivial_i, :] = [10.  5. 46. 51.]
463        cord_individul_obj[indivial_i, :] = [11.  5. 28. 33.]
464        cord_individul_obj[indivial_i, :] = [12. 10. 78. 88.]
465        cord_individul_obj[indivial_i, :] = [13.  9. 12. 21.]
466        cord_individul_obj[indivial_i, :] = [14. 10.  4. 14.]
467
468    min(cord_individul_obj[:, 3]) =  7.0
469    historl_G_best_iter[iter, 3] =  7.0
470 Iteration calculate over
471
472
473
474
475 All item are in Bin and:
476    Bin area =  1080
477    Real_area =  146.0
478    Proportion_of_area =  0.13518518518518519
479        BEST_CHROM =
480        berth:  [ 6.5 26.  20.  11.5 15.5  2. ]
481        time:  [0. 0. 0. 0. 0. 0.]
482        num_QC:  [3. 1. 5. 3. 2. 2.]
483    Objective function values and some other indicators:
484        Obj0 = 5.00           Obj1 = 2.00           Obj0 + Obj1 = 7.00
485        Total movement of crane: 2.00
486        Total waiting time in berth position: 0.00
487        Total index of q during berthing: 584.00
488    Specific arrangement for each vessel:
```

| 489 | V_id: 0 | li: 5.0 | xi: 6.5 | bow of i: 4.0 | tail of i: 9.0 | gama_i0: 0.0 | gama_i1: 1.0 |
| | | gama_i1 + 1: 2.0 | gama_i1 - gama_i0: 1.0 | duration_time_i: 2.0 | demand_i: 80.0 | work load_i: 80.0 | work load gap_i: 0 |

| 490 | V_id: 1 | li: 6.0 | xi: 26.0 | bow of i: 23.0 | tail of i: 29.0 | gama_i0: 0.0 | gama_i1: 5.0 |
| | | gama_i1 + 1: 6.0 | gama_i1 - gama_i0: 5.0 | duration_time_i: 6.0 | demand_i: 120.0 | work load_i: 120.0 | work load gap_i: 0 |

| 491 | V_id: 2 | li: 6.0 | xi: 20.0 | bow of i: 17.0 | tail of i: 23.0 | gama_i0: 0.0 | gama_i1: 2.0 |
| | | gama_i1 + 1: 3.0 | gama_i1 - gama_i0: 2.0 | duration_time_i: 3.0 | demand_i: 260.0 | work load_i: 260.0 | work load gap_i: 0 |

| 492 | V_id: 3 | li: 5.0 | xi: 11.5 | bow of i: 9.0 | tail of i: 14.0 | gama_i0: 0.0 | gama_i1: 1.0 |
| | | gama_i1 + 1: 2.0 | gama_i1 - gama_i0: 1.0 | duration_time_i: 2.0 | demand_i: 80.0 | work |

492	load_i: 80.0		work load gap_i: 0				
493	V_id: 4	li: 3.0	xi: 15.5	bow of i: 14.0	tail of i: 17.0	gama_i0: 0.0	gama_i1: 4
	.0	gama_i1 + 1: 5.0	gama_i1 - gama_i0: 4.0	duration_time_i: 5.0	demand_i: 200.0		work
	load_i: 200.0	work load gap_i: 0					
494	V_id: 5	li: 4.0	xi: 2.0	bow of i: 0.0	tail of i: 4.0	gama_i0: 0.0	gama_i1: 5.0
		gama_i1 + 1: 6.0	gama_i1 - gama_i0: 5.0	duration_time_i: 6.0	demand_i: 220.0		work load_i:
	220.0	work load gap_i: 0					
495							
496	Algorithm finished and the total CPU time: 98 s						
497	End						
498							