```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=13910
3
   import sys; print('Python %s on %s' % (sys.version, sys.platform))
   01_My_Python_Code'])
6
  PyDev console: starting.
  Python 3.9.7 (tags/v3.9.7:1016ef3, Aug 30 2021, 20:19:38) [MSC v.1929 64 bit (AMD64)] on win32
8
  python code/01_My_Python_Code')
10 Backend TkAgg is interactive backend. Turning interactive mode on.
   Waiting 1s.....
12
13
  This is the R_3_2 standard_test.xlsx optimization process solved by ENSGA-II algorithm.
14
15
   Start
16
17
   Before iteration:
18
     Read basic data
19
     Parameter setting:
20
       trail = 58
21
       Pop\_size = 30
       Tolerance iteration unchanged number = 10
23
       Chrom size = 9
       Iter_num_GA = 300
24
25
       Select_rate = 0.85
26
       Crossover rate = 0.95
       Mutation rate = 0.95
27
28
       Mu_oper_type = 1
29
       vessel\_move\_way = 2
30
       coefficient for Obj1= 1.9
       coefficient for Obj2= 0.100000000000000009
31
32
33
   Iteration begin:
34
35
   Beging the No. 0 iteration:
     obj[0] = 12.58 temp_best_value_gen = 12.58
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
40
     obj[gen-1] = 12.58 temp_best_value_gen = 12.56
     Yes, update solution and obj[gen] = 12.56
41
     solution chromosome =
42
43
       first level: [ [3.07 3.99 6.72]
       second level: [4. 1. 3.]
44
       third level: [4. 6. 4.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 12.56 temp_best_value_gen = 12.56
49
50
     No, maintain solution and obj[gen] = 12.56, and the tolerance_counter = 1
51
     solution chromosome =
52
       first level: [ [3.07 3.99 6.72]
53
       second level: [4. 1. 3.]
54
       third level: [4. 6. 4.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 12.56 temp best value gen = 12.56
59
     No, maintain solution and obj[gen] = 12.56, and the tolerance_counter = 2
60
     solution chromosome =
       first level: [ [3.07 3.99 6.72]
61
62
       second level: [4. 1. 3.]
       third level: [4. 6. 4.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 12.56 temp_best_value_gen = 11.35
68
     Yes, update solution and obj[gen] = 11.35
69
     solution chromosome =
70
       first level: [ [2.45 3.7 6.07]
71
       second level: [3. 1. 2.]
       third level: [2. 7. 6.]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 11.35 temp best value gen = 11.35
76
     No, maintain solution and obj[gen] = 11.35, and the tolerance_counter = 1
77
     solution chromosome =
78
       first level: [ [2.45 3.7 6.07]
```

```
second level: [3. 1. 2.]
 80
 81
          third level: [2. 7. 6.]]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
       obj[gen-1] = 11.35 temp_best_value_gen = 11.35
No, maintain solution_and obj[gen] = 11.35, and the tolerance_counter = 2
 85
 86
 87
        solution chromosome =
 88
          first level: [ [2.45 3.7 6.07]
 89
          second level: [3. 1. 2.]
 90
          third level: [2. 7. 6.]]
 91
        The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
        obj[gen-1] = 11.35 temp_best_value_gen = 11.35
 94
 95
        No, maintain solution and obj[gen] = 11.35, and the tolerance_counter = 3
 96
        solution chromosome =
          first level: [ [2.45 3.7 6.07]
 97
 98
          second level: [3. 1. 2.]
 99
          third level: [2. 7. 6.]]
100
        The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
        obj[gen-1] = 11.35 temp best value gen = 11.35
103
104
        No, maintain solution and obj[gen] = 11.35, and the tolerance_counter = 4
105
        solution chromosome =
          first level: [ [2.45 3.7 6.07]
106
          second level: [3. 1. 2.]
107
108
          third level: [2. 7. 6.]]
109
        The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 11.35 temp_best_value_gen = 11.35
113
        No, maintain solution and obj[gen] = 11.35, and the tolerance_counter = 5
        solution chromosome =
114
115
          first level: [ [2.45 3.7 6.07]
116
          second level: [3. 1. 2.]
          third level: [2. 7. 6.]]
117
118
        The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
        obj[gen-1] = 11.35 temp_best_value_gen = 11.35
121
        No, maintain solution and obj[gen] = 11.35, and the tolerance_counter = 6
122
123
        solution chromosome =
124
          first level: [ [2.45 3.7 6.07]
          second level: [3. 1. 2.]
125
126
          third level: [2. 7. 6.]]
127
        The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130
        obj[gen-1] = 11.35 temp_best_value_gen = 11.05
131
        Yes, update solution and obj[gen] = 11.05
132
        solution chromosome =
          first level: [ [5.05 3.64 3.62]
133
134
          second level: [3. 1. 5.]
135
          third level: [4. 6. 3.]]
136
        The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
        obj[gen-1] = 11.05 temp_best_value_gen = 11.05
140
        No, maintain solution and obj[gen] = 11.05, and the tolerance_counter = 1
141
        solution chromosome =
142
          first level: [ [5.05 3.64 3.62]
          second level: [3. 1. 5.]
143
          third level: [4. 6. 3.]]
144
145
        The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
148
        obj[gen-1] = 11.05 temp_best_value_gen = 8.10
149
        Yes, update solution and obj[gen] = 8.10
150
        solution chromosome =
          first level: [ [ 2. 14.5 7.5]
151
152
          second level: [1.3.1.]
153
          third level: [3. 4. 6.]]
154
        The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
        obj[gen-1] = 8.10 temp_best_value_gen = 8.10
158
        No, maintain solution and obj[gen] = 8.10, and the tolerance_counter = 1
159
        solution chromosome =
160
          first level: [ [ 2. 14.5 7.5]
          second level: [1. 3. 1.]
161
          third level: [3. 4. 6.]]
162
163
        The No. 14 iteration is finished!
```

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164
165 Beging the No. 15 iteration:
        obj[gen-1] = 8.10 temp_best_value_gen = 8.10
166
167
       No, maintain solution and obj[gen] = 8.10, and the tolerance_counter = 2
        solution chromosome =
168
          first level: [ [ 2. 14.5 7.5]
169
170
          second level: [1. 3. 1.]
171
          third level: [3. 4. 6.]]
172
        The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175
       obj[gen-1] = 8.10 temp_best_value_gen = 6.20
176
        Yes, update solution and obj[gen] = 6.20
177
       solution chromosome =
          first level: [ [ 2. 7.5 14.5]
178
179
          second level: [1.1.3.]
180
          third level: [3. 6. 4.]]
181
       The No. 16 iteration is finished!
182
183 Beging the No. 17 iteration:
       obj[gen-1] = 6.20 temp_best_value_gen = 6.20
184
185
       No, maintain solution and obj[gen] = 6.20, and the tolerance_counter = 1
        solution chromosome =
186
187
          first level: [ 2. 7.5 14.5]
          second level: [1. 1. 3.]
188
          third level: [3. 6. 4.]]
189
190
       The No. 17 iteration is finished!
191
192 Beging the No. 18 iteration:
193
       obj[gen-1] = 6.20 temp_best_value_gen = 6.20
194
       No, maintain solution and obj[gen] = 6.20, and the tolerance counter = 2
195
       solution chromosome =
196
          first level: [ [ 2. 7.5 14.5]
197
          second level: [1.1.3.]
198
          third level: [3. 6. 4.]]
199
       The No. 18 iteration is finished!
200
201 Beging the No. 19 iteration:
202
       obj[gen-1] = 6.20 temp_best_value_gen = 6.20
203
        No, maintain solution and obj[gen] = 6.20, and the tolerance_counter = 3
204
        solution chromosome =
205
          first level: [ [ 2. 7.5 14.5]
          second level: [1. 1. 3.]
206
207
          third level: [3. 6. 4.]]
208
        The No. 19 iteration is finished!
209
210 Beging the No. 20 iteration:
211
       obj[gen-1] = 6.20 temp_best_value_gen = 6.20
212
       No, maintain solution and obj[gen] = 6.20, and the tolerance_counter = 4
       solution chromosome =
213
214
          first level: [ [ 2. 7.5 14.5]
215
          second level: [1. 1. 3.]
216
          third level: [3. 6. 4.]]
217
       The No. 20 iteration is finished!
218
219 Beging the No. 21 iteration:
       obj[gen-1] = 6.20 temp best value gen = 6.20
220
221
       No, maintain solution and obj[gen] = 6.20, and the tolerance_counter = 5
222
       solution chromosome
223
          first level: [ [ 2. 7.5 14.5]
224
          second level: [1.1.3.]
225
          third level: [3. 6. 4.]]
226
       The No. 21 iteration is finished!
227
228 Beging the No. 22 iteration:
229
       obj[gen-1] = 6.20 temp_best_value_gen = 6.20
230
       No, maintain solution and obj[gen] = 6.20, and the tolerance_counter = 6
231
       solution chromosome =
232
          first level: [ [ 2. 7.5 14.5]
233
          second level: [1. 1. 3.]
234
          third level: [3. 6. 4.]
235
       The No. 22 iteration is finished!
236
237 Beging the No. 23 iteration:
       obj[gen-1] = 6.20 temp_best_value_gen = 6.20
238
239
       No, maintain solution and obj[gen] = 6.20, and the tolerance_counter = 7
240
       solution chromosome =
241
          first level: [ [ 2. 7.5 14.5]
242
          second level: [1.1.3.]
243
          third level: [3. 6. 4.]]
244
       The No. 23 iteration is finished!
245
246 Beging the No. 24 iteration:
       obj[gen-1] = 6.20 temp_best_value_gen = 6.20
247
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unknown
248
        No, maintain solution and obj[gen] = 6.20, and the tolerance_counter = 8
249
        solution chromosome =
           first level: [ [ 2. 7.5 14.5] second level: [1. 1. 3.]
250
251
252
           third level: [3. 6. 4.]]
253
         The No. 24 iteration is finished!
254
255 Beging the No. 25 iteration:
256
        obj[gen-1] = 6.20 temp_best_value_gen = 6.20
        No, maintain solution and obj[gen] = 6.20, and the tolerance_counter = 9
257
258
        solution chromosome =
259
           first level: [ [ 2. 7.5 14.5]
260
           second level: [1. 1. 3.]
261
           third level: [3. 6. 4.]]
262
         The No. 25 iteration is finished!
263
Beging the No. 26 iteration:

265 obj[gen-1] = 6.20 temp_best_value_gen = 6.20
266
        No, maintain solution and obj[gen] = 6.20, and the tolerance_counter = 10
267
        solution chromosome =
           first level: [ [ 2. 7.5 14.5]
268
269
           second level: [1. 1. 3.]
270
           third level: [3. 6. 4.]]
271
        The No. 26 iteration is finished!
272
273
274
275 The iteration is terminated and then visulize the solution:
276
        solution chromosome =
           first level: [ [ 2. 7.5 14.5]
277
           second level: [1. 1. 3.] third level: [3. 6. 4.]]
278
279
280
        Objective function values and some other indicators:
281
           Obj0 = 3.00
                                  Obj1 = 5.00
                                                         Obj0 + Obj1 = 8.00
           Total movement of crane: 0.00
282
           Total waiting time in berth position: 5.00
283
284
           Total index of q during berthing: 85.00
285
         Specific arrangement for each vessel:
286
           V_id: 0
                                                    xi: 2.0
                                                                        bow of i: 0.0
                                                                                                    tail of i: 4.0
                                                                                                                              gama_i0: 1.0
                               li: 4.0
                                                                                                                                                          gama_i1: 3.0
                     duration\_time\_i{:}~2.0
                                                         demand_i: 120.0
                                                                                        work load_i: 120.0
                                                                                                                         work load gap_i: 0
287
            V_id: 1
                               1i: 7.0
                                                                        bow of i: 4.0
                                                                                                    tail of i: 11.0
                                                                                                                                 gama_i0: 1.0
                                                                                                                                                             gama_i1: 3.0
                     duration time i: 2.0
                                                         demand i: 140.0
                                                                                        work load i: 140.0
                                                                                                                         work load gap i: 0
                                                                                                                                   gama_i0: 3.0
            V_id: 2
                                                                                                       tail of i: 18.0
288
                               li: 7.0
                                                                           bow of i: 11.0
                                                                                                                                                                gama_i1: 4
      .0
                        duration_time_i: 1.0
                                                            demand_i: 60.0
                                                                                          work load_i: 60.0
                                                                                                                            work load gap_i: 0
289
290 Algorithm finished and the total CPU time: 1046 s
291 End
292
```