```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=14952
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_6 _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] = 14.60 temp_best_value_gen = 14.60
36
37
     The No. 0 iteration is finished!
38
39
   Beging the No. 1 iteration:
40
     obj[gen-1] = 14.60 temp_best_value_gen = 14.00
     Yes, update solution and obj[gen] = 14.00
41
     solution chromosome =
42
       first level: [ [ 3. 14. 8.5]
43
       second level: [5. 2. 1.]
44
       third level: [5. 4. 5.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 14.00 temp_best_value_gen = 14.00
49
50
     No, maintain solution and obj[gen] = 14.00, and the tolerance_counter = 1
51
     solution chromosome =
52
       first level: [[3. 14. 8.5]
53
       second level: [5. 2. 1.]
54
       third level: [5. 4. 5.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 14.00 temp best value gen = 14.00
59
     No, maintain solution and obj[gen] = 14.00, and the tolerance_counter = 2
60
     solution chromosome =
61
       first level: [[3. 14. 8.5]
62
       second level: [5. 2. 1.]
63
       third level: [5. 4. 5.]]
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 14.00 temp\_best\_value\_gen = 6.20
68
     Yes, update solution and obj[gen] = 6.20
69
     solution chromosome =
70
       first level: [ [ 3. 8.5 14. ]
       second level: [2. 1. 2.]
71
       third level: [4. 5. 4.]]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obj[gen-1] = 6.20 temp_best_value_gen = 6.20
76
     No, maintain solution and obj[gen] = 6.20, and the tolerance_counter = 1
77
78
     solution chromosome =
       first level: [[3. 8.5 14.]
```

```
second level: [2. 1. 2.]
 81
          third level: [4. 5. 4.]]
 82
       The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 85
       obj[gen-1] = 6.20 temp best value gen = 6.20
 86
       No, maintain solution and obj[gen] = 6.20, and the tolerance_counter = 2
 87
        solution chromosome =
 88
          first level: [ [ 3. 8.5 14. ]
 89
          second level: [2. 1. 2.]
 90
          third level: [4. 5. 4.]]
 91
       The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
 94
        obj[gen-1] = 6.20 temp_best_value_gen = 6.20
 95
       No, maintain solution and obj[gen] = 6.20, and the tolerance_counter = 3
 96
       solution chromosome =
 97
          first level: [ [ 3. 8.5 14. ]
 98
          second level: [2.1.2.]
 99
          third level: [4. 5. 4.]]
100
       The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
103
       obj[gen-1] = 6.20 temp best value gen = 6.20
104
       No, maintain solution and obj[gen] = 6.20, and the tolerance_counter = 4
105
        solution chromosome =
          first level: [ [ 3. 8.5 14. ]
106
107
          second level: [2. 1. 2.]
108
          third level: [4. 5. 4.]]
109
       The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 6.20 temp_best_value_gen = 6.20
113
       No, maintain solution and obj[gen] = 6.20, and the tolerance_counter = 5
       solution chromosome =
114
115
          first level: [ [ 3. 8.5 14. ]
116
          second level: [2. 1. 2.]
          third level: [4. 5. 4.]]
117
118
       The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
       obj[gen-1] = 6.20 temp_best_value_gen = 6.20
122
       No, maintain solution and obj[gen] = 6.20, and the tolerance_counter = 6
123
        solution chromosome =
124
          first level: [ [ 3. 8.5 14. ]
125
          second level: [2. 1. 2.]
126
          third level: [4. 5. 4.]]
127
       The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130
        obj[gen-1] = 6.20 temp_best_value_gen = 6.10
131
        Yes, update solution and obj[gen] = 6.10
132
       solution chromosome =
          first level: [ [ 3. 8.5 14. ]
133
134
          second level: [1.1.2.]
135
          third level: [3. 5. 4.]]
136
       The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
       obj[gen-1] = 6.10 temp_best_value_gen = 6.10
140
       No, maintain solution and obj[gen] = 6.10, and the tolerance_counter = 1
141
        solution chromosome =
142
          first level: [ [ 3. 8.5 14. ]
143
          second level: [1. 1. 2.]
          third level: [3. 5. 4.]]
144
145
       The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
148
        obj[gen-1] = 6.10 temp_best_value_gen = 6.10
149
       No, maintain solution and obj[gen] = 6.10, and the tolerance_counter = 2
150
       solution chromosome =
151
          first level: [ [ 3. 8.5 14. ]
152
          second level: [1.1.2.]
153
          third level: [3. 5. 4.]]
154
       The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
       obj[gen-1] = 6.10 temp_best_value_gen = 6.10
158
       No, maintain solution and obj[gen] = 6.10, and the tolerance_counter = 3
159
        solution chromosome =
160
          first level: [ [ 3. 8.5 14. ]
          second level: [1. 1. 2.]
161
162
          third level: [3. 5. 4.]]
        The No. 14 iteration is finished!
163
```

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164
165 Beging the No. 15 iteration:
        obj[gen-1] = 6.10 temp_best_value_gen = 6.10
166
167
       No, maintain solution and obj[gen] = 6.10, and the tolerance_counter = 4
        solution chromosome =
168
169
          first level: [ [ 3. 8.5 14. ]
170
          second level: [1.1.2.]
171
          third level: [3. 5. 4.]]
172
        The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175
       obj[gen-1] = 6.10 temp_best_value_gen = 6.10
176
       No, maintain solution and obj[gen] = 6.10, and the tolerance_counter = 5
177
       solution chromosome =
          first level: [ [ 3. 8.5 14. ]
178
179
          second level: [1.1.2.]
180
          third level: [3. 5. 4.]]
181
       The No. 16 iteration is finished!
182
183 Beging the No. 17 iteration:
       obj[gen-1] = 6.10 temp_best_value_gen = 6.10
184
185
       No, maintain solution and obj[gen] = 6.10, and the tolerance_counter = 6
186
        solution chromosome =
187
          first level: [ [ 3. 8.5 14. ]
188
          second level: [1. 1. 2.]
189
          third level: [3. 5. 4.]]
190
       The No. 17 iteration is finished!
191
192 Beging the No. 18 iteration:
193
       obj[gen-1] = 6.10 temp_best_value_gen = 6.00
194
        Yes, update solution and obj[gen] = 6.00
195
       solution chromosome =
196
          first level: [ [ 3. 8.5 14. ]
197
          second level: [1. 0. 2.]
198
          third level: [3. 5. 4.]]
199
       The No. 18 iteration is finished!
200
201 Beging the No. 19 iteration:
202
       obj[gen-1] = 6.00 temp_best_value_gen = 6.00
203
        No, maintain solution and obj[gen] = 6.00, and the tolerance_counter = 1
204
        solution chromosome =
205
          first level: [ [ 3. 8.5 14. ]
          second level: [1. 0. 2.]
206
207
          third level: [3. 5. 4.]]
208
        The No. 19 iteration is finished!
209
210 Beging the No. 20 iteration:
211
       obj[gen-1] = 6.00 temp_best_value_gen = 6.00
212
       No, maintain solution and obj[gen] = 6.00, and the tolerance_counter = 2
213
       solution chromosome =
214
          first level: [ [ 3. 8.5 14. ]
215
          second level: [1. 0. 2.]
216
          third level: [3. 5. 4.]]
217
       The No. 20 iteration is finished!
218
219 Beging the No. 21 iteration:
       obj[gen-1] = 6.00 temp best value gen = 6.00
220
221
       No, maintain solution and obj[gen] = 6.00, and the tolerance_counter = 3
222
       solution chromosome
223
          first level: [ [ 3. 8.5 14. ]
224
          second level: [1. 0. 2.]
225
          third level: [3. 5. 4.]]
226
       The No. 21 iteration is finished!
227
228 Beging the No. 22 iteration:
229
       obj[gen-1] = 6.00 temp_best_value_gen = 6.00
230
       No, maintain solution and obj[gen] = 6.00, and the tolerance_counter = 4
231
       solution chromosome =
232
          first level: [ [ 3. 8.5 14. ]
233
          second level: [1. 0. 2.]
234
          third level: [3. 5. 4.]]
235
       The No. 22 iteration is finished!
236
237 Beging the No. 23 iteration:
       obj[gen-1] = 6.00 temp_best_value_gen = 6.00
238
239
       No, maintain solution and obj[gen] = 6.00, and the tolerance_counter = 5
240
       solution chromosome
241
          first level: [[3. 8.5 14.]
242
          second level: [1. 0. 2.]
243
          third level: [3. 5. 4.]]
244
       The No. 23 iteration is finished!
245
246 Beging the No. 24 iteration:
       obj[gen-1] = 6.00 temp_best_value_gen = 6.00
247
```

```
248
        No, maintain solution and obj[gen] = 6.00, and the tolerance_counter = 6
249
        solution chromosome =
250
          first level: [ [ 3. 8.5 14. ]
          second level: [1. 0. 2.]
251
252
          third level: [3. 5. 4.]]
253
        The No. 24 iteration is finished!
254
255 Beging the No. 25 iteration:
256
        obj[gen-1] = 6.00 temp best value gen = 6.00
257
        No, maintain solution and obj[gen] = 6.00, and the tolerance_counter = 7
258
        solution chromosome =
          first level: [[3. 8.5 14.]
259
260
          second level: [1. 0. 2.]
261
          third level: [3. 5. 4.]]
262
        The No. 25 iteration is finished!
263
264 Beging the No. 26 iteration:
265 obj[gen-1] = 6.00 temp_best_value_gen = 6.00
266
        No, maintain solution and obj[gen] = 6.00, and the tolerance_counter = 8
267
        solution chromosome =
          first level: [ [ 3. 8.5 14. ]
268
269
          second level: [1. 0. 2.]
270
          third level: [3. 5. 4.]]
271
        The No. 26 iteration is finished!
272
273 Beging the No. 27 iteration:
274
        obj[gen-1] = 6.00 temp best value gen = 6.00
275
        No, maintain solution and obj[gen] = 6.00, and the tolerance_counter = 9
276
        solution chromosome =
          first level: [ [ 3. 8.5 14. ]
277
278
          second level: [1. 0. 2.]
279
          third level: [3. 5. 4.]]
280
        The No. 27 iteration is finished!
281
282 Beging the No. 28 iteration:
        obj[gen-1] = 6.00 temp_best_value_gen = 6.00
283
284
        No, maintain solution and obj[gen] = 6.00, and the tolerance_counter = 10
285
        solution chromosome =
286
          first level: [ [ 3. 8.5 14. ]
287
          second level: [1. 0. 2.]
288
          third level: [3. 5. 4.]]
289
        The No. 28 iteration is finished!
290
291
292
293 The iteration is terminated and then visulize the solution:
294
        solution chromosome =
295
          first level: [ [ 3. 8.5 14. ]
296
          second level: [1. 0. 2.]
          third level: [3. 5. 4.]]
297
298
        Objective function values and some other indicators:
299
          Obj0 = 3.00
                                 Obj1 = 3.00
                                                       Obj0 + Obj1 = 6.00
300
           Total movement of crane: 0.00
           Total waiting time in berth position: 3.00
301
302
          Total index of q during berthing: 120.00
        Specific arrangement for each vessel:
303
                                                  xi: 3.0
304
           V_id: 0
                              li: 6.0
                                                                      bow of i: 0.0
                                                                                                  tail of i: 6.0
                                                                                                                           gama i0: 1.0
                                                                                                                                                       gama i1: 4.0
                                                        demand_i: 140.0
                    duration\_time\_i{:}~3.0
                                                                                      work load_i: 140.0
                                                                                                                      work load gap_i: 0
305
           V_id: 1
                              li: 5.0
                                                   xi: 8.5
                                                                      bow of i: 6.0
                                                                                                  tail of i: 11.0
                                                                                                                              gama_i0: 0.0
                                                                                                                                                         gama_i1: 2.0
                    duration_time_i: 2.0
                                                       demand_i: 140.0
                                                                                     work load_i: 140.0
                                                                                                                      work load gap_i: 0
                                                                         bow of i: 11.0
                                                                                                    tail of i: 17.0
                                                                                                                                gama_i0: 2.0
306
           V_id: 2
                              li: 6.0
                                                   xi: 14.0
                                                                                                                                                            gama_i1: 4
                                                                                        work load_i: 100.0
                       duration_time_i: 2.0
                                                          demand_i: 100.0
                                                                                                                         work load gap_i: 0
307
308 Algorithm finished and the total CPU time: 1096 s
309 End
310
```