```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=59085
3
   import sys; print('Python %s on %s' % (sys.version, sys.platform))
   01_My_Python_Code'])
5
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_2_1 _standard_test.xlsx optimization process solved by ENSGA-II algorithm.
14
15
   Start
16
17
   Before iteration:
18
     Read basic data
19
     Parameter setting:
       trail = 21
20
21
       Pop\_size = 30
       Tolerance iteration unchanged number = 8
23
       Chrom size = 6
       Iter_num_GA = 300
24
25
       Select_rate = 0.75
26
       Crossover rate = 0.75
       Mutation rate = 0.75
27
28
       Mu_oper_type = 2
29
       vessel\_move\_way = 1
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] = 6.58 temp_best_value_gen = 6.58
36
37
     The No. 0 iteration is finished!
38
39
   Beging the No. 1 iteration:
40
     obj[gen-1] = 6.58 temp_best_value_gen = 6.26
     Yes, update solution and obj[gen] = 6.26
41
     solution chromosome =
42
43
       first level: [ [2.06 4.05]
       second level: [0, 3,]
44
       third level: [3. 7.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 6.26 temp_best_value_gen = 4.79
49
50
     Yes, update solution and obj[gen] = 4.79
51
     solution chromosome =
52
       first level: [ [2.11 4.17]
53
       second level: [0. 2.]
54
       third level: [4. 7.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 4.79 temp best value gen = 4.79
59
     No, maintain solution and obj[gen] = 4.79, and the tolerance_counter = 1
60
     solution chromosome =
61
       first level: [ [2.11 4.17]
62
       second level: [0. 2.]
       third level: [4. 7.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 4.79 temp_best_value_gen = 4.79
68
     No, maintain solution and obj[gen] = 4.79, and the tolerance_counter = 2
69
     solution chromosome =
70
       first level: [ [2.11 4.17]
71
       second level: [0. 2.]
       third level: [4. 7.]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obj[gen-1] = 4.79 temp_best_value_gen = 4.79
76
     No, maintain solution and obj[gen] = 4.79, and the tolerance counter = 3
77
78
     solution chromosome =
       first level: [ [2.11 4.17]
```

```
80
          second level: [0, 2,]
 81
          third level: [4. 7.]]
 82
       The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 85
       obj[gen-1] = 4.79 temp best value gen = 4.79
       No, maintain solution and obj[gen] = 4.79, and the tolerance_counter = 4
 86
 87
        solution chromosome =
 88
          first level: [[2.11 4.17]
 89
          second level: [0. 2.]
 90
          third level: [4. 7.]]
 91
       The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
 94
        obj[gen-1] = 4.79 temp_best_value_gen = 4.77
 95
        Yes, update solution and obj[gen] = 4.77
 96
       solution chromosome =
 97
          first level: [ [2.17 4.02]
 98
          second level: [0. 2.]
 99
          third level: [4. 8.]]
100
       The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
103
       obj[gen-1] = 4.77 temp best value gen = 4.77
104
       No, maintain solution and obj[gen] = 4.77, and the tolerance_counter = 1
105
        solution chromosome =
          first level: [[2.17 4.02]
106
          second level: [0. 2.]
107
          third level: [4. 8.]]
108
109
       The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 4.77 temp_best_value_gen = 4.77
113
       No, maintain solution and obj[gen] = 4.77, and the tolerance_counter = 2
       solution chromosome =
114
115
          first level: [ [2.17 4.02]
116
          second level: [0. 2.]
          third level: [4, 8,]]
117
118
       The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
       obj[gen-1] = 4.77 temp_best_value_gen = 4.77
122
       No, maintain solution and obj[gen] = 4.77, and the tolerance_counter = 3
123
        solution chromosome =
124
          first level: [[2.17 4.02]
125
          second level: [0. 2.]
126
          third level: [4. 8.]]
127
       The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130
        obj[gen-1] = 4.77 temp_best_value_gen = 4.08
131
        Yes, update solution and obj[gen] = 4.08
132
       solution chromosome =
133
          first level: [ [2.22 4. ]
134
          second level: [1. 0.]
135
          third level: [4. 7.]]
136
       The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
       obj[gen-1] = 4.08 temp_best_value_gen = 4.08
140
       No, maintain solution and obj[gen] = 4.08, and the tolerance_counter = 1
141
        solution chromosome =
142
          first level: [ [2.22 4. ]
          second level: [1. 0.]
143
          third level: [4. 7.]]
144
145
       The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
        obj[gen-1] = 4.08 temp_best_value_gen = 4.08
148
149
       No, maintain solution and obj[gen] = 4.08, and the tolerance_counter = 2
150
       solution chromosome =
151
          first level: [ [2.22 4. ]
152
          second level: [1. 0.]
153
          third level: [4. 7.]]
154
       The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
       obj[gen-1] = 4.08 temp_best_value_gen = 4.08
158
       No, maintain solution and obj[gen] = 4.08, and the tolerance_counter = 3
159
        solution chromosome =
160
          first level: [ [2.22 4. ]
          second level: [1. 0.]
161
162
          third level: [4. 7.]]
163
       The No. 14 iteration is finished!
```

```
164
165 Beging the No. 15 iteration:
        obj[gen-1] = 4.08 temp_best_value_gen = 4.08
166
167
       No, maintain solution and obj[gen] = 4.08, and the tolerance_counter = 4
168
       solution chromosome =
169
          first level: [[2.22 4.]]
170
          second level: [1. 0.]
171
          third level: [4. 7.]]
172
        The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175
       obj[gen-1] = 4.08 temp_best_value_gen = 4.08
       No, maintain solution and obj[gen] = \overline{4.08}, and the tolerance counter = 5
176
177
       solution chromosome =
178
          first level: [ [2.22 4. ]
179
          second level: [1. 0.]
180
          third level: [4. 7.]]
181
       The No. 16 iteration is finished!
182
183 Beging the No. 17 iteration:
       obj[gen-1] = 4.08 temp_best_value_gen = 4.08
184
185
       No, maintain solution and obj[gen] = 4.08, and the tolerance_counter = 6
186
        solution chromosome =
187
          first level: [ [2.22 4. ]
          second level: [1. 0.]
188
189
          third level: [4. 7.]]
190
       The No. 17 iteration is finished!
191
192 Beging the No. 18 iteration:
193
       obj[gen-1] = 4.08 temp_best_value_gen = 3.93
194
        Yes, update solution and obj[gen] = 3.93
195
       solution chromosome =
196
          first level: [ [2.03 4. ]
197
          second level: [1. 0.]
          third level: [4. 7.]
198
199
       The No. 18 iteration is finished!
200
201 Beging the No. 19 iteration:
202
       obj[gen-1] = 3.93 temp_best_value_gen = 3.93
203
       No, maintain solution and obj[gen] = 3.93, and the tolerance_counter = 1
204
       solution chromosome =
205
          first level: [ [2.03 4. ]
206
          second level: [1. 0.]
207
          third level: [4. 7.]]
208
        The No. 19 iteration is finished!
209
210 Beging the No. 20 iteration:
211
       obj[gen-1] = 3.93 temp_best_value_gen = 3.93
212
       No, maintain solution and obj[gen] = 3.93, and the tolerance_counter = 2
213
       solution chromosome =
214
          first level: [[2.03 4.]]
215
          second level: [1. 0.]
216
          third level: [4. 7.]]
       The No. 20 iteration is finished!
217
218
219 Beging the No. 21 iteration:
       obj[gen-1] = 3.93 temp_best_value_gen = 3.93
220
221
       No, maintain solution and obj[gen] = 3.93, and the tolerance_counter = 3
222
       solution chromosome
223
          first level: [[2.03 4.]]
224
          second level: [1. 0.]
225
          third level: [4. 7.]]
226
       The No. 21 iteration is finished!
227
228 Beging the No. 22 iteration:
229
       obj[gen-1] = 3.93 temp_best_value_gen = 3.93
230
       No, maintain solution and obj[gen] = 3.93, and the tolerance_counter = 4
231
       solution chromosome =
232
          first level: [ [2.03 4. ]
233
          second level: [1. 0.]
234
          third level: [4. 7.]]
235
       The No. 22 iteration is finished!
236
237 Beging the No. 23 iteration:
238
        obj[gen-1] = 3.93 temp_best_value_gen = 3.93
239
       No, maintain solution and obj[gen] = 3.93, and the tolerance_counter = 5
240
       solution chromosome
241
          first level: [ [2.03 4. ]
242
          second level: [1. 0.]
243
          third level: [4. 7.]]
244
       The No. 23 iteration is finished!
245
246 Beging the No. 24 iteration:
247
       obj[gen-1] = 3.93
                          temp_best_value_gen = 3.93
```

```
No, maintain solution and obj[gen] = 3.93, and the tolerance_counter = 6
248
249
        solution chromosome =
250
          first level: [ [2.03 4. ]
251
          second level: [1. 0.]
252
          third level: [4. 7.]]
253
        The No. 24 iteration is finished!
254
255 Beging the No. 25 iteration:
256
        obj[gen-1] = 3.93 temp_best_value_gen = 3.93
        No, maintain solution and obj[gen] = 3.93, and the tolerance_counter = 7
257
258
        solution chromosome =
259
          first level: [ [2.03 4. ]
260
          second level: [1. 0.]
261
          third level: [4. 7.]]
262
        The No. 25 iteration is finished!
263
Beging the No. 26 iteration:

265 obj[gen-1] = 3.93 temp_best_value_gen = 3.93
266
        No, maintain solution and obj[gen] = 3.93, and the tolerance_counter = 8
267
        solution chromosome =
268
          first level: [ [2.03 4. ]
269
          second level: [1. 0.]
270
          third level: [4. 7.]]
271
        The No. 26 iteration is finished!
272
273
274 ---
275 The iteration is terminated and then visulize the solution:
276
        solution chromosome =
277
          first level: [ [2.03 4. ]
          second level: [1. 0.] third level: [4. 7.]]
278
279
280
        Objective function values and some other indicators:
281
          Obj0 = 2.00
                                 Obj1 = 1.31
                                                        Obj0 + Obj1 = 3.31
          Total movement of crane: 0.31
282
          Total waiting time in berth position: 1.00
283
284
          Total index of q during berthing: 27.00
285
        Specific arrangement for each vessel:
                                                                                                   tail of i: 4.0
                                                                                                                            gama_i0: 1.0
286
           V_id: 0
                                                   xi: 2.0
                                                                       bow of i: 0.0
                              li: 4.0
                                                                                                                                                        gama_i1: 3.0
                     duration\_time\_i{:}~2.0
                                                        demand_i: 160.0
                                                                                      work load_i: 160.0
                                                                                                                        work load gap_i: 0
                                                                       bow of i: 0.0
287
           V_id: 1
                              1i: 8.0
                                                                                                   tail of i: 8.0
                                                                                                                            gama_i0: 0.0
                                                                                                                                                        gama_i1: 1.0
                     duration_time_i: 1.0
                                                        demand i: 120.0
                                                                                      work load i: 120.0
                                                                                                                       work load gap_i: 0
288
289 Algorithm finished and the total CPU time: 817 s
290 End
291
```