```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=43074
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_5_5 standard_test.xlsx optimization process solved by ENSGA-II algorithm.
14
15
   Start
16
17
   Before iteration:
     Read basic data
18
19
     Parameter setting:
20
       trail = 58
21
       Pop\_size = 30
       Tolerance iteration unchanged number = 10
23
       Chrom size = 15
       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] = 10.30 temp_best_value_gen = 10.30
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 10.30 temp_best_value_gen = 10.30
40
     No, maintain solution and obj[gen] = 10.30, and the tolerance_counter = 1
41
42
     solution chromosome =
43
       first level: [ [ 4.5 11. 16. 21. 25.5]
       second level: [2. 3. 3. 1. 2.]
44
45
       third level: [3. 3. 3. 4. 8.]]
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 10.30 temp_best_value_gen = 10.30
49
50
     No, maintain solution and obj[gen] = 10.30, and the tolerance_counter = 2
51
     solution chromosome =
52
       first level: [ [ 4.5 11. 16. 21. 25.5]
53
       second level: [2. 3. 3. 1. 2.]
54
       third level: [3. 3. 3. 4. 8.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 10.30 temp best value gen = 10.30
59
     No, maintain solution and obj[gen] = 10.30, and the tolerance_counter = 3
60
     solution chromosome =
61
       first level: [[4.5 11. 16. 21. 25.5]
62
       second level: [2. 3. 3. 1. 2.]
       third level: [3. 3. 3. 4. 8.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 10.30 temp_best_value_gen = 10.30
68
     No, maintain solution and obj[gen] = 10.30, and the tolerance_counter = 4
69
     solution chromosome =
70
       first level: [ [ 4.5 11. 16. 21. 25.5]
71
       second level: [2. 3. 3. 1. 2.]
       third level: [3. 3. 3. 4. 8.]]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 10.30 temp best value gen = 10.30
76
     No, maintain solution and obj[gen] = 10.30, and the tolerance_counter = 5
77
     solution chromosome =
78
       first level: [ [ 4.5 11. 16. 21. 25.5]
```

```
second level: [2. 3. 3. 1. 2.]
 80
 81
          third level: [3. 3. 3. 4. 8.]]
 82
       The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 85
       obj[gen-1] = 10.30 temp best value gen = 10.30
       No, maintain solution and obj[gen] = 10.30, and the tolerance_counter = 6
 86
 87
        solution chromosome =
 88
          first level: [ [ 4.5 11. 16. 21. 25.5]
 89
          second level: [2. 3. 3. 1. 2.]
 90
          third level: [3. 3. 3. 4. 8.]]
 91
       The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
 94
        obj[gen-1] = 10.30 temp_best_value_gen = 10.30
 95
       No, maintain solution and obj[gen] = 10.30, and the tolerance_counter = 7
 96
       solution chromosome =
 97
          first level: [ [ 4.5 11. 16. 21. 25.5]
 98
          second level: [2. 3. 3. 1. 2.]
 99
          third level: [3. 3. 3. 4. 8.]]
100
       The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
       obj[gen-1] = 10.30 temp best value gen = 10.30
103
104
       No, maintain solution and obj[gen] = 10.30, and the tolerance_counter = 8
105
        solution chromosome =
          first level: [ [ 4.5 11. 16. 21. 25.5]
106
          second level: [2. 3. 3. 1. 2.]
107
108
          third level: [3. 3. 3. 4. 8.]]
109
       The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 10.30 temp_best_value_gen = 10.30
113
       No, maintain solution and obj[gen] = 10.30, and the tolerance_counter = 9
       solution chromosome =
114
          first level: [ [ 4.5 11. 16. 21. 25.5]
115
116
          second level: [2. 3. 3. 1. 2.]
          third level: [3, 3, 3, 4, 8,]]
117
118
       The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
       obj[gen-1] = 10.30 temp_best_value_gen = 10.10
121
122
        Yes, update solution and obj[gen] = 10.10
123
        solution chromosome =
124
          first level: [ [ 4.5 11. 16. 21. 25.5]
125
          second level: [0. 3. 3. 1. 2.]
126
          third level: [2. 3. 3. 4. 8.]]
127
       The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
        obj[gen-1] = 10.10 temp_best_value_gen = 10.10
130
131
       No, maintain solution and obj[gen] = 10.10, and the tolerance_counter = 1
132
       solution chromosome =
          first level: [ [ 4.5 11. 16. 21. 25.5]
133
134
          second level: [0. 3. 3. 1. 2.]
135
          third level: [2, 3, 3, 4, 8,]]
136
       The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
       obj[gen-1] = 10.10 temp_best_value_gen = 10.10
140
       No, maintain solution and obj[gen] = 10.10, and the tolerance_counter = 2
141
        solution chromosome =
142
          first level: [ [ 4.5 11. 16. 21. 25.5]
143
          second level: [0. 3. 3. 1. 2.]
          third level: [2. 3. 3. 4. 8.]]
144
145
       The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
148
        obj[gen-1] = 10.10 temp_best_value_gen = 10.10
149
       No, maintain solution and obj[gen] = 10.10, and the tolerance_counter = 3
150
       solution chromosome =
151
          first level: [ [ 4.5 11. 16. 21. 25.5]
152
          second level: [0. 3. 3. 1. 2.]
153
          third level: [2, 3, 3, 4, 8,]]
154
       The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
       obj[gen-1] = 10.10 temp_best_value_gen = 8.50
158
        Yes, update solution and obj[gen] = 8.50
159
        solution chromosome =
          first level: [ [ 4.5 11. 16. 21. 25.5]
160
          second level: [0. 3. 3. 1. 2.]
161
162
          third level: [2. 3. 3. 3. 2.]]
        The No. 14 iteration is finished!
163
```

```
164
165 Beging the No. 15 iteration:
        obj[gen-1] = 8.50 temp_best_value_gen = 8.50
166
167
       No, maintain solution and obj[gen] = 8.50, and the tolerance_counter = 1
168
        solution chromosome =
          first level: [ [ 4.5 11. 16. 21. 25.5]
169
          second level: [0. 3. 3. 1. 2.]
170
171
          third level: [2. 3. 3. 3. 2.]]
172
        The No. 15 iteration is finished!
173
174
     Beging the No. 16 iteration:
175
       obj[gen-1] = 8.50 temp_best_value_gen = 8.50
176
       No, maintain solution and obj[gen] = 8.50, and the tolerance_counter = 2
177
       solution chromosome =
178
          first level: [ [ 4.5 11. 16. 21. 25.5]
179
          second level: [0. 3. 3. 1. 2.]
180
          third level: [2. 3. 3. 3. 2.]]
181
        The No. 16 iteration is finished!
182
183
     Beging the No. 17 iteration:
       obj[gen-1] = 8.50 temp_best_value_gen = 8.50
184
185
        No, maintain solution and obj[gen] = 8.50, and the tolerance_counter = 3
186
        solution chromosome =
187
          first level: [ [ 4.5 11. 16. 21. 25.5]
188
          second level: [0. 3. 3. 1. 2.]
189
          third level: [2. 3. 3. 3. 2.]]
190
        The No. 17 iteration is finished!
191
192
     Beging the No. 18 iteration:
193
       obj[gen-1] = 8.50 temp_best_value_gen = 8.30
194
        Yes, update solution and obj[gen] = 8.30
195
       solution chromosome =
196
          first level: [ [ 4.5 11. 16. 21. 25.5]
197
          second level: [0. 1. 3. 1. 2.]
198
          third level: [2. 3. 3. 3. 2.]]
199
       The No. 18 iteration is finished!
200
201 Beging the No. 19 iteration:
202
       obj[gen-1] = 8.30 temp_best_value_gen = 8.30
203
        No, maintain solution and obj[gen] = 8.30, and the tolerance_counter = 1
204
        solution chromosome =
205
          first level: [ [ 4.5 11. 16. 21. 25.5]
          second level: [0. 1. 3. 1. 2.]
206
207
          third level: [2. 3. 3. 3. 2.]]
208
        The No. 19 iteration is finished!
209
210 Beging the No. 20 iteration:
211
        obj[gen-1] = 8.30 temp_best_value_gen = 8.30
212
       No, maintain solution and obj[gen] = 8.30, and the tolerance_counter = 2
213
       solution chromosome =
          first level: [ [ 4.5 11. 16. 21. 25.5]
214
215
          second level: [0. 1. 3. 1. 2.]
216
          third level: [2. 3. 3. 3. 2.]]
217
       The No. 20 iteration is finished!
218
219 Beging the No. 21 iteration:
       obj[gen-1] = 8.30 temp best value gen = 8.30
220
221
       No, maintain solution and obj[gen] = 8.30, and the tolerance_counter = 3
222
        solution chromosome
223
          first level: [ [ 4.5 11. 16. 21. 25.5]
224
          second level: [0. 1. 3. 1. 2.]
225
          third level: [2. 3. 3. 3. 2.]]
226
       The No. 21 iteration is finished!
227
228
229
230 The iteration is terminated and then visulize the solution:
231
       solution chromosome =
          first level: [ [ 4.5 11. 16. 21. 25.5]
232
233
          second level: [0. 1. 3. 1. 2.]
234
          third level: [2. 3. 3. 3. 2.]]
235
        Objective function values and some other indicators:
236
          Obj0 = 4.00
                                Obj1 = 7.00
                                                       Obj0 + Obj1 = 11.00
237
          Total movement of crane: 0.00
238
          Total waiting time in berth position: 7.00
239
          Total index of q during berthing: 249.00
240
        Specific arrangement for each vessel:
241
          V_id: 0
                              1i: 9.0
                                                  xi: 4.5
                                                                      bow of i: 0.0
                                                                                                 tail of i: 9.0
                                                                                                                          gama i0: 0.0
                                                                                                                                                     gama_i1: 4.0
                    duration_time_i: 4.0
                                                                                    work load_i: 160.0
                                                       demand_i: 160.0
                                                                                                                     work load gap_i: 0
242
          V id: 1
                              li: 4.0
                                                                        bow of i: 9.0
                                                                                                   tail of i: 13.0
                                                                                                                               gama_i0: 1.0
                                                                                                                                                          gama_i1: 2
     .0
                       duration time i: 1.0
                                                         demand i: 60.0
                                                                                       work load i: 60.0
                                                                                                                       work load gap i: 0
                                                                                                                               gama i0: 3.0
243
          V id: 2
                                                                                                   tail of i: 19.0
                              li: 6.0
                                                  xi: 16.0
                                                                        bow of i: 13.0
                                                                                                                                                          gama i1:5
                       duration_time_i: 2.0
                                                         demand_i: 100.0
                                                                                       work load_i: 100.0
     .0
                                                                                                                       work load gap_i: 0
          V id: 3
                              1i: 4.0
                                                  xi: 21.0
                                                                        bow of i: 19.0
                                                                                                   tail of i: 23.0
                                                                                                                               gama_i0: 1.0
                                                                                                                                                          gama_i1: 2
```

unknown

244 .0		duration_time	- i: 1 0	demand_i: 60.0	work load_i: 60.0	work load gap_i: 0	
244 .0 245 .0	V id:	4 li: 9.0 duration_time	xi: 2	25.5 bow of i: 21.0 demand_i: 80.0	work load_i: 60.0 tail of i: 30.0 work load_i: 80.0	gama_i0: 2.0 work load gap_i: 0	gama_i1: 4
246					WOLK IDAU_I. OU.U	work todu gap_t. U	
247 Alg 248 En 249	Algorithm finished and the total CPU time: 1215 s End						
249							