```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=35165
 3
     import sys; print('Python %s on %s' % (sys.version, sys.platform))
     01_My_Python_Code', 'E:/1 \\ \text{0} \\ \
     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')
    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 = 12
20
21
            Pop\_size = 10
             Tolerance iteration unchanged number = 10
23
             Chrom\_size = 6
            Iter_num_GA = 300
24
25
             Select_rate = 0.8
26
             Crossover rate = 0.8
27
             Mutation rate = 0.75
28
             Mu_oper_type = 1
29
             vessel\_move\_way = 2
30
            coefficient for Obj1= 1.0
            coefficient for Obj2= 1.0
31
             gen = 0
32
33
     Iteration begin:
34
35
     Beging the No. 0 iteration:
36
         obj[0] = 17.00
                                temp_best_value_gen = 17.00
37
         The No. 0 iteration is finished!
38
39
     Beging the No. 1 iteration:
40
         obj[gen-1] = 17.00 temp_best_value_gen = 10.00
         Yes, update solution and obj[gen] = 10.00
41
         solution chromosome =
42
43
             first level: [ [8. 4.]
            second level: [3, 1,]
44
            third level: [2. 3.]]
45
         The No. 1 iteration is finished!
46
47
48
     Beging the No. 2 iteration:
         obj[gen-1] = 10.00 temp_best_value_gen = 10.00
49
50
         No, maintain solution and obj[gen] = 10.00, and the tolerance_counter = 1
51
         solution chromosome =
52
             first level: [ [8. 4.]
             second level: [3. 1.]
53
54
            third level: [2. 3.]]
55
         The No. 2 iteration is finished!
56
57
     Beging the No. 3 iteration:
58
         obi[gen-1] = 10.00 temp best value gen = 10.00
59
         No, maintain solution and obj[gen] = 10.00, and the tolerance_counter = 2
60
         solution chromosome =
61
             first level: [ [8. 4.]
62
             second level: [3. 1.]
            third level: [2. 3.]]
63
         The No. 3 iteration is finished!
64
65
     Beging the No. 4 iteration:
66
67
         obj[gen-1] = 10.00 temp_best_value_gen = 10.00
68
         No, maintain solution and obj[gen] = 10.00, and the tolerance_counter = 3
69
         solution chromosome =
70
            first level: [ [8. 4.]
             second level: [3. 1.]
71
            third level: [2. 3.]
73
         The No. 4 iteration is finished!
74
75
     Beging the No. 5 iteration:
         obi[gen-1] = 10.00 temp best value gen = 10.00
76
         No, maintain solution and obj[gen] = 10.00, and the tolerance counter = 4
77
         solution chromosome =
78
             first level: [[8. 4.]
```

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80
          second level: [3. 1.]
 81
          third level: [2. 3.]]
 82
       The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 85
       obj[gen-1] = 10.00 temp best value gen = 8.00
        Yes, update solution and obj[gen] = 8.00
 86
 87
       solution chromosome =
 88
          first level: [ [8. 4.]
 89
          second level: [1. 3.]
 90
          third level: [4. 4.]]
 91
       The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
 94
        obj[gen-1] = 8.00 temp_best_value_gen = 8.00
 95
       No, maintain solution and obj[gen] = 8.00, and the tolerance_counter = 1
 96
       solution chromosome =
 97
          first level: [ [8. 4.]
 98
          second level: [1.3.]
 99
          third level: [4, 4,]]
100
       The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
103
       obj[gen-1] = 8.00 temp best value gen = 8.00
104
       No, maintain solution and obj[gen] = 8.00, and the tolerance_counter = 2
105
        solution chromosome =
          first level: [ [8. 4.]
106
107
          second level: [1.3.]
108
          third level: [4. 4.]]
109
       The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 8.00 temp_best_value_gen = 8.00
113
       No, maintain solution and obj[gen] = 8.00, and the tolerance_counter = 3
       solution chromosome =
114
115
          first level: [ [8. 4.]
116
          second level: [1.3.]
          third level: [4, 4,]]
117
118
       The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
       obj[gen-1] = 8.00 temp_best_value_gen = 8.00
122
       No, maintain solution and obj[gen] = 8.00, and the tolerance_counter = 4
123
        solution chromosome =
124
          first level: [[8. 4.]
125
          second level: [1. 3.]
126
          third level: [4. 4.]]
127
       The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130
        obj[gen-1] = 8.00 temp_best_value_gen = 8.00
131
       No, maintain solution and obj[gen] = 8.00, and the tolerance_counter = 5
132
       solution chromosome =
133
          first level: [ [8. 4.]
134
          second level: [1.3.]
135
          third level: [4, 4,]]
136
       The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
       obj[gen-1] = 8.00 temp_best_value gen = 4.00
139
140
        Yes, update solution and obj[gen] = 4.00
141
        solution chromosome =
142
          first level: [ [2. 8.]
          second level: [1. 1.]
143
          third level: [4. 3.]]
144
145
       The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
148
        obj[gen-1] = 4.00 temp_best_value_gen = 4.00
149
       No, maintain solution and obj[gen] = 4.00, and the tolerance_counter = 1
150
       solution chromosome =
151
          first level: [ [2. 8.]
152
          second level: [1. 1.]
153
          third level: [4. 3.]]
154
       The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157
       obj[gen-1] = 4.00 temp_best_value_gen = 4.00
158
       No, maintain solution and obj[gen] = 4.00, and the tolerance_counter = 2
159
        solution chromosome =
160
          first level: [ [2. 8.]
          second level: [1, 1,]
161
162
          third level: [4. 3.]]
163
        The No. 14 iteration is finished!
```

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164
165 Beging the No. 15 iteration:
        obj[gen-1] = 4.00 temp_best_value_gen = 4.00
166
167
       No, maintain solution and obj[gen] = 4.00, and the tolerance_counter = 3
168
        solution chromosome =
169
          first level: [ [2, 8,]
170
          second level: [1. 1.]
171
          third level: [4. 3.]]
172
        The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175
       obj[gen-1] = 4.00 temp_best_value_gen = 4.00
       No, maintain solution and obj[gen] = 4.00, and the tolerance counter = 4
176
177
       solution chromosome =
178
          first level: [ [2. 8.]
179
          second level: [1. 1.]
180
          third level: [4. 3.]]
181
        The No. 16 iteration is finished!
182
183 Beging the No. 17 iteration:
       obj[gen-1] = 4.00 temp_best_value_gen = 4.00
184
185
       No, maintain solution and obj[gen] = 4.00, and the tolerance_counter = 5
186
        solution chromosome =
187
          first level: [ [2. 8.]
          second level: [1. 1.]
188
          third level: [4. 3.]]
189
190
       The No. 17 iteration is finished!
191
192
     Beging the No. 18 iteration:
193
       obj[gen-1] = 4.00 temp_best_value_gen = 4.00
194
       No, maintain solution and obj[gen] = 4.00, and the tolerance counter = 6
195
       solution chromosome =
196
          first level: [ [2. 8.]
197
          second level: [1. 1.]
198
          third level: [4. 3.]]
199
       The No. 18 iteration is finished!
200
201 Beging the No. 19 iteration:
202
       obj[gen-1] = 4.00 temp_best_value_gen = 4.00
203
        No, maintain solution and obj[gen] = 4.00, and the tolerance_counter = 7
204
        solution chromosome =
205
          first level: [ [2. 8.]
          second level: [1. 1.]
206
207
          third level: [4. 3.]]
208
        The No. 19 iteration is finished!
209
210 Beging the No. 20 iteration:
211
       obj[gen-1] = 4.00 temp_best_value_gen = 4.00
212
       No, maintain solution and obj[gen] = 4.00, and the tolerance_counter = 8
       solution chromosome =
213
          first level: [ [2. 8.]
214
215
          second level: [1. 1.]
216
          third level: [4. 3.]]
       The No. 20 iteration is finished!
217
218
219 Beging the No. 21 iteration:
       obj[gen-1] = 4.00 temp_best_value_gen = 4.00
220
221
       No, maintain solution and obj[gen] = 4.00, and the tolerance_counter = 9
222
       solution chromosome
223
          first level: [ [2. 8.]
          second level: [1. 1.]
224
225
          third level: [4. 3.]]
226
       The No. 21 iteration is finished!
227
228 Beging the No. 22 iteration:
229
       obj[gen-1] = 4.00 temp_best_value_gen = 4.00
230
       No, maintain solution and obj[gen] = 4.00, and the tolerance_counter = 10
231
       solution chromosome =
232
          first level: [ [2. 8.]
233
          second level: [1. 1.]
234
          third level: [4. 3.]
235
       The No. 22 iteration is finished!
236
237
238
239 The iteration is terminated and then visulize the solution:
240
       solution chromosome
241
          first level: [ [2. 8.]
242
          second level: [1.1.]
243
          third level: [4. 3.]]
244
        Objective function values and some other indicators:
                                Obj1 = 2.00
                                                      Obj0 + Obj1 = 4.00
245
          Obi0 = 2.00
          Total movement of crane: 0.00
246
247
          Total waiting time in berth position: 2.00
```

| unknown | | | | | | | | | |
|------------|------------------|-------|------------|-------------------------------|-----------|-----------------------------------|---|------------------------------------|--------------|
| 248 | Total | ind | ex of q du | uring berthing: 4 | 2.00 | | | | |
| 249 250 | Specific V_id | arr | angement | t for each vessel: li: 4.0 | | 2.0 bow of i: 0.0 | tail of i: 4.0 | gama_i0: 1.0 | gama_i1: 3.0 |
| 230 | v_lu | . 0 | duration | _time_i: 2.0 | AI. | demand i: 160 0 | work load i: 160.0 | work load gap i: 0 | gama_11. 5.0 |
| 251 | V_id | : 1 | | li: 8.0 | xi: | 8.0 bow of i: 4.0 demand_i: 120.0 | work load_i: 160.0 tail of i: 12.0 work load_i: 120.0 | gama_i0: 1.0 work load gap_i: 0 | gama_i1: 3.0 |
| | | | duration | _time_i: 2.0 | | demand_i: 120.0 | work load_i: 120.0 | work load gap_i: 0 | |
| 252 | Algorithm | fini | shed and | the total CPU ti | me: 204 | c | | | |
| 254 | End | 11111 | siicu aiiu | the total CFO th | IIIC. 204 | 5 | | | |
| 255 | End | | | | | | | | |
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