```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=56495
     import sys; print('Python %s on %s' % (sys.version, sys.platform))
 3
     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')
10 Backend TkAgg is interactive backend. Turning interactive mode on.
     Waiting 1s....
12
13
    This is the R_9_6 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 = 27
            Iter_num_GA = 300
24
25
             Select_rate = 0.85
26
             Crossover rate = 0.95
27
             Mutation rate = 0.95
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] = 23.00 temp_best_value_gen = 23.00
36
         The No. 0 iteration is finished!
37
38
39
     Beging the No. 1 iteration:
         obj[gen-1] = 23.00 temp_best_value_gen = 23.00
40
         No, maintain solution and obj[gen] = \overline{23.00}, and the tolerance_counter = 1
41
42
         solution chromosome =
43
             first level: [ [ 3. 10.5 17. 21.5 26.5 25.5 3. 1.5 4. ]
             second level: [0. 1. 5. 6. 1. 5. 1. 6. 3.]
44
            third level: [5. 3. 2. 4. 2. 7. 6. 2. 5.]]
45
46
         The No. 1 iteration is finished!
47
48
     Beging the No. 2 iteration:
obj[gen-1] = 23.00 temp_best_value_gen = 19.80
49
50
         Yes, update solution and obj[gen] = 19.80
51
         solution chromosome =
52
             first level: [ ] 3. 10.5 17. 21.5 25.5 25.5 3. 1.5 4. ]
53
             second level: [0. 1. 5. 6. 5. 1. 1. 6. 3.]
54
            third level: [5. 3. 2. 4. 5. 2. 6. 2. 5.]]
55
         The No. 2 iteration is finished!
56
57
     Beging the No. 3 iteration:
58
         obi[gen-1] = 19.80 temp best value gen = 19.80
59
         No, maintain solution and obj[gen] = 19.80, and the tolerance_counter = 1
60
         solution chromosome =
61
             first level: [ [ 3. 10.5 17. 21.5 25.5 25.5 3. 1.5 4. ]
62
             second level: [0. 1. 5. 6. 5. 1. 1. 6. 3.]
            third level: [5. 3. 2. 4. 5. 2. 6. 2. 5.]]
63
         The No. 3 iteration is finished!
64
65
     Beging the No. 4 iteration:
66
67
         obj[gen-1] = 19.80 temp_best_value_gen = 19.80
68
         No, maintain solution and obj[gen] = 19.80, and the tolerance_counter = 2
69
         solution chromosome =
             first level: [ [ 3. 10.5 17. 21.5 25.5 25.5 3. 1.5 4. ]
70
             second level: [0. 1. 5. 6. 5. 1. 1. 6. 3.]
71
             third level: [5. 3. 2. 4. 5. 2. 6. 2. 5.]]
73
         The No. 4 iteration is finished!
74
75
     Beging the No. 5 iteration:
         obi[gen-1] = 19.80 temp best value gen = 19.80
76
         No, maintain solution and obj[gen] = 19.80, and the tolerance_counter = 3
77
78
         solution chromosome =
             first level: [[3. 10.5 17. 21.5 25.5 25.5 3. 1.5 4.]
```

```
second level: [0. 1. 5. 6. 5. 1. 1. 6. 3.]
 80
          third level: [5. 3. 2. 4. 5. 2. 6. 2. 5.]]
 81
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
       obj[gen-1] = 19.80 temp best value gen = 19.80
 85
       No, maintain solution and obj[gen] = 19.80, and the tolerance_counter = 4
 86
 87
        solution chromosome =
 88
          first level: [ [ 3. 10.5 17. 21.5 25.5 25.5 3. 1.5 4. ]
 89
          second level: [0. 1. 5. 6. 5. 1. 1. 6. 3.]
          third level: [5. 3. 2. 4. 5. 2. 6. 2. 5.]]
 90
 91
        The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
 94
        obj[gen-1] = 19.80 temp\_best\_value\_gen = 19.80
 95
        No, maintain solution and obj[gen] = 19.80, and the tolerance_counter = 5
 96
       solution chromosome =
 97
          first level: [ [ 3. 10.5 17. 21.5 25.5 25.5 3. 1.5 4. ]
 98
          second level: [0. 1. 5. 6. 5. 1. 1. 6. 3.]
 99
          third level: [5. 3. 2. 4. 5. 2. 6. 2. 5.]]
100
       The No. 7 iteration is finished!
101
     Beging the No. 8 iteration:
102
       obj[gen-1] = 19.80 temp best value gen = 19.80
103
104
       No, maintain solution and obj[gen] = 19.80, and the tolerance_counter = 6
105
        solution chromosome =
          first level: [ [ 3. 10.5 17. 21.5 25.5 25.5 3. 1.5 4. ]
106
          second level: [0. 1. 5. 6. 5. 1. 1. 6. 3.] third level: [5. 3. 2. 4. 5. 2. 6. 2. 5.]]
107
108
109
       The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 19.80 temp\_best\_value\_gen = 19.80
113
        No, maintain solution and obj[gen] = 19.80, and the tolerance_counter = 7
114
       solution chromosome =
          first level: [[3. 10.5 17. 21.5 25.5 25.5 3. 1.5 4.]
115
116
          second level: [0. 1. 5. 6. 5. 1. 1. 6. 3.]
          third level: [5. 3. 2. 4. 5. 2. 6. 2. 5.]]
117
       The No. 9 iteration is finished!
118
119
120 Beging the No. 10 iteration:
       obj[gen-1] = 19.80 temp_best_value_gen = 19.80
121
       No, maintain solution and obj[gen] = 19.80, and the tolerance_counter = 8
122
123
        solution chromosome =
124
          first level: [ [ 3. 10.5 17. 21.5 25.5 25.5 3. 1.5 4. ]
125
          second level: [0. 1. 5. 6. 5. 1. 1. 6. 3.]
126
          third level: [5. 3. 2. 4. 5. 2. 6. 2. 5.]]
127
        The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
        obj[gen-1] = 19.80 temp_best_value_gen = 19.80
130
131
       No, maintain solution and obj[gen] = 19.80, and the tolerance_counter = 9
132
       solution chromosome =
          first level: [ [ 3. 10.5 17. 21.5 25.5 25.5 3. 1.5 4. ]
133
134
          second level: [0. 1. 5. 6. 5. 1. 1. 6. 3.]
135
          third level: [5. 3. 2. 4. 5. 2. 6. 2. 5.]]
       The No. 11 iteration is finished!
136
137
138 Beging the No. 12 iteration:
       obj[gen-1] = 19.80 temp_best_value_gen = 19.80
139
140
       No, maintain solution and obj[gen] = 19.80, and the tolerance_counter = 10
141
        solution chromosome =
          first level: [ [ 3. 10.5 17. 21.5 25.5 25.5 3. 1.5 4. ]
142
143
          second level: [0. 1. 5. 6. 5. 1. 1. 6. 3.]
          third level: [5. 3. 2. 4. 5. 2. 6. 2. 5.]]
144
145
        The No. 12 iteration is finished!
146
147
148 ---
149 The iteration is terminated and then visulize the solution:
150
       solution chromosome =
151
          first level: [ [ 3. 10.5 17. 21.5 25.5 25.5 3. 1.5 4. ]
152
           second level: [0. 1. 5. 6. 5. 1. 1. 6. 3.]
          third level: [5. 3. 2. 4. 5. 2. 6. 2. 5.]]
153
154
        Objective function values and some other indicators:
                                 Obj1 = 46.00
155
          Obj0 = 8.00
                                                        Obj0 + Obj1 = 54.00
156
          Total movement of crane: 18.00
157
          Total waiting time in berth position: 28.00
158
          Total index of q during berthing: 486.00
159
        Specific arrangement for each vessel:
160
           V id: 0
                              li: 6.0
                                                   xi: 3.0
                                                                       bow of i: 0.0
                                                                                                   tail of i: 6.0
                                                                                                                             gama i0: 0.0
                                                                                                                                                         gama i1: 1.0
                                                        demand_i: 100.0
                    duration_time_i: 1.0
                                                                                      work load i: 100.0
                                                                                                                        work load gap_i: 0
                                                                          bow of i: 6.0
          V_id: 1
                                                                                                      tail of i: 15.0
                                                                                                                                  gama_i0: 1.0
161
                              li: 9.0
                                                   xi: 10.5
                                                                                                                                                              gama_i1: 3
                       duration_time_i: 2.0
                                                           demand i: 80.0
                                                                                         work load i: 80.0
                                                                                                                          work load gap_i: 0
```

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162	V_id: 2	li: 4.0	xi: 17.0	bow of i: 1:	5.0 tail of i: 19.0	gama_i0: 5.0	gama_i1: 9
.0		duration_time_i: 4.0	demand	l_i: 140.0	work load_i: 140.0	work load gap_i: 0	
163	V_id: 3	li: 5.0	xi: 21.5	bow of i: 19	9.0 tail of i: 24.0	gama_i0: 6.0	gama_i1: 8
.0		duration_time_i: 2.0	demand	l_i: 120.0	work load_i: 120.0	work load gap_i: 0	
164	V_id: 4	li: 5.0	xi: 25.5	bow of i: 23	3.0 tail of i: 28.0	gama_i0: 5.0	gama_i1: 6
.0		duration_time_i: 1.0	demand	l_i: 60.0	work load_i: 60.0	work load gap_i: 0	
165	V_id: 5	li: 9.0	xi: 25.5	bow of i: 2	1.0 tail of i: 30.0	gama_i0: 1.0	gama_i1: 4
.0		duration_time_i: 3.0	demand	l_i: 120.0	work load_i: 120.0	work load gap_i: 0	
166	V_id: 6	li: 6.0	xi: 3.0	bow of i: 0.0	tail of i: 6.0	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	
167	V_id: 7	li: 3.0	xi: 1.5	bow of i: 0.0	tail of i: 3.0	gama_i0: 6.0	gama_i1: 9.0
		duration_time_i: 3.0	demand_i	: 120.0	work load_i: 120.0	work load gap_i: 0	
168	V_id: 8	li: 8.0	xi: 4.0	bow of i: 0.0	tail of i: 8.0	gama_i0: 3.0	gama_i1: 5.0
		duration_time_i: 2.0	demand_i	: 120.0	work load_i: 120.0	work load gap_i: 0	
169							

170 Algorithm finished and the total CPU time: 1263 s 171 End 172