```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=27889
 2
 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')
10 Backend TkAgg is interactive backend. Turning interactive mode on.
     Waiting 1s....
12
13
    This is the R_9_7 _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
34
     Iteration begin:
35
     Beging the No. 0 iteration:
         obj[0] = 15.50 temp_best_value_gen = 15.50
36
         The No. 0 iteration is finished!
37
38
39
     Beging the No. 1 iteration:
         obj[gen-1] = 15.50 temp_best_value_gen = 15.50
40
         No, maintain solution and obj[gen] = 15.50, and the tolerance_counter = 1
41
42
         solution chromosome =
43
             first level: [ [ 3. 9. 15. 19.5 22.5 25.5 4. 2.5 2.5]
             second level: [3. 2. 2. 1. 0. 3. 4. 1. 6.]
44
45
            third level: [6. 5. 3. 2. 2. 2. 4. 5. 4.]]
46
         The No. 1 iteration is finished!
47
48
     Beging the No. 2 iteration:
         obj[gen-1] = 15.50 temp_best_value_gen = 15.50
49
50
         No, maintain solution and obj[gen] = 15.50, and the tolerance_counter = 2
51
         solution chromosome =
52
             first level: [ [ 3. 9. 15. 19.5 22.5 25.5 4. 2.5 2.5]
53
             second level: [3. 2. 2. 1. 0. 3. 4. 1. 6.]
54
            third level: [6. 5. 3. 2. 2. 2. 4. 5. 4.]]
55
         The No. 2 iteration is finished!
56
57
     Beging the No. 3 iteration:
58
         obi[gen-1] = 15.50 temp best value gen = 15.50
59
         No, maintain solution and obj[gen] = 15.50, and the tolerance_counter = 3
60
         solution chromosome =
61
             first level: [ [ 3. 9. 15. 19.5 22.5 25.5 4. 2.5 2.5]
            second level: [3. 2. 2. 1. 0. 3. 4. 1. 6.] third level: [6. 5. 3. 2. 2. 2. 4. 5. 4.]
62
63
         The No. 3 iteration is finished!
64
65
     Beging the No. 4 iteration:
66
67
         obj[gen-1] = 15.50 temp_best_value_gen = 15.50
68
         No, maintain solution and obj[gen] = 15.50, and the tolerance_counter = 4
69
         solution chromosome =
70
             first level: [[3. 9. 15. 19.5 22.5 25.5 4. 2.5 2.5]
             second level: [3. 2. 2. 1. 0. 3. 4. 1. 6.]
71
            third level: [6. 5. 3. 2. 2. 2. 4. 5. 4.]]
73
         The No. 4 iteration is finished!
74
75
    Beging the No. 5 iteration:
         obi[gen-1] = 15.50 temp best value gen = 15.50
76
         No, maintain solution and obj[gen] = 15.50, and the tolerance_counter = 5
77
78
         solution chromosome =
             first level: [[3. 9. 15. 19.5 22.5 25.5 4. 2.5 2.5]
```

```
80
          second level: [3. 2. 2. 1. 0. 3. 4. 1. 6.]
 81
          third level: [6. 5. 3. 2. 2. 2. 4. 5. 4.]]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 85
       obj[gen-1] = 15.50 temp best value gen = 15.50
       No, maintain solution and obj[gen] = 15.50, and the tolerance_counter = 6
 86
 87
        solution chromosome =
 88
          first level: [ [ 3. 9. 15. 19.5 22.5 25.5 4. 2.5 2.5]
 89
          second level: [3. 2. 2. 1. 0. 3. 4. 1. 6.]
 90
          third level: [6. 5. 3. 2. 2. 2. 4. 5. 4.]]
 91
        The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
 94
        obj[gen-1] = 15.50 temp_best_value_gen = 15.50
 95
        No, maintain solution and obj[gen] = 15.50, and the tolerance_counter = 7
 96
       solution chromosome =
          first level: [[3. 9. 15. 19.5 22.5 25.5 4. 2.5 2.5]
 97
          second level: [3. 2. 2. 1. 0. 3. 4. 1. 6.]
 98
 99
          third level: [6. 5. 3. 2. 2. 2. 4. 5. 4.]]
100
       The No. 7 iteration is finished!
101
102
     Beging the No. 8 iteration:
       obj[gen-1] = 15.50 temp best value gen = 15.30
103
        Yes, update solution and obj[gen] = 15.30
104
105
       solution chromosome =
          first level: [ [ 3. 3. 15. 19.5 22.5 25.5 4. 2.5 9. ]
106
          second level: [3. 6. 2. 1. 0. 3. 4. 1. 2.] third level: [6. 4. 3. 2. 2. 2. 4. 5. 5.]
107
108
109
       The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 15.30 temp_best_value_gen = 15.30
113
        No, maintain solution and obj[gen] = 15.30, and the tolerance_counter = 1
114
       solution chromosome =
115
          first level: [ [ 3. 3. 15. 19.5 22.5 25.5 4. 2.5 9. ]
116
          second level: [3. 6. 2. 1. 0. 3. 4. 1. 2.]
          third level: [6. 4. 3. 2. 2. 2. 4. 5. 5.]]
117
       The No. 9 iteration is finished!
118
119
120 Beging the No. 10 iteration:
       obj[gen-1] = 15.30 temp_best_value_gen = 14.70
121
        Yes, update solution and obj[gen] = 14.70
122
123
        solution chromosome =
          first level: [[3. 3. 9. 19.5 22.5 25.5 4. 2.5 15.]
124
125
          second level: [3. 6. 2. 1. 0. 3. 4. 1. 2.]
126
          third level: [6. 4. 5. 2. 2. 2. 4. 5. 3.]]
127
        The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
        obj[gen-1] = 14.70 temp_best_value_gen = 14.70
130
131
       No, maintain solution and obj[gen] = 14.70, and the tolerance_counter = 1
132
       solution chromosome =
          first level: [[3. 3. 9. 19.5 22.5 25.5 4. 2.5 15.]
133
134
          second level: [3. 6. 2. 1. 0. 3. 4. 1. 2.]
135
          third level: [6. 4. 5. 2. 2. 2. 4. 5. 3.]]
       The No. 11 iteration is finished!
136
137
138 Beging the No. 12 iteration:
       obj[gen-1] = 14.70 temp_best_value_gen = 14.70
139
140
       No, maintain solution and obj[gen] = 14.70, and the tolerance_counter = 2
141
        solution chromosome =
142
          first level: [ [ 3. 3. 9. 19.5 22.5 25.5 4. 2.5 15. ]
143
          second level: [3. 6. 2. 1. 0. 3. 4. 1. 2.]
          third level: [6. 4. 5. 2. 2. 2. 4. 5. 3.]]
144
145
        The No. 12 iteration is finished!
146
147
148 ---
149 The iteration is terminated and then visulize the solution:
150
       solution chromosome =
          first level: [[3. 3. 9. 19.5 22.5 25.5 4. 2.5 15.]
151
152
          second level: [3. 6. 2. 1. 0. 3. 4. 1. 2.]
153
          third level: [6. 4. 5. 2. 2. 2. 4. 5. 3.]]
154
        Objective function values and some other indicators:
                                Obj1 = 33.00
155
          Obj0 = 6.00
                                                       Obj0 + Obj1 = 39.00
156
          Total movement of crane: 11.00
157
          Total waiting time in berth position: 22.00
158
          Total index of q during berthing: 533.00
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: 3.0
                                                                                                                                                        gama i1: 4.0
                                                                                      work load_i: 60.0
                    duration_time_i: 1.0
                                                       demand_i: 60.0
                                                                                                                       work load gap_i: 0
                                                                       bow of i: 0.0
161
          V_id: 1
                                                                                                   tail of i: 6.0
                              li: 6.0
                                                   xi: 3.0
                                                                                                                            gama_i0: 6.0
                                                                                                                                                        gama_i1: 7.0
                    duration_time_i: 1.0
                                                        demand i: 80.0
                                                                                      work load i: 80.0
                                                                                                                       work load gap_i: 0
```

162	V_id: 2	li: 6.0	xi: 9.0	bow of i: 6.0	tail of i: 12.0	gama_i0: 2.0	gama_i1: 3.0
		duration_time_i: 1.0	demand_	i: 100.0	work load_i: 100.0	work load gap_i: 0	
163	V_id: 3	li: 3.0			.0 tail of i: 21.0	gama_i0: 1.0	gama_i1: 4
.0		duration_time_i: 3.0	deman	d_i: 120.0	work load_i: 120.0	work load gap_i: 0	
164	V_id: 4	li: 3.0	xi: 22.5	bow of i: 21	.0 tail of i: 24.0	gama_i0: 0.0	gama_i1: 3
.0		duration_time_i: 3.0	deman	d_i: 120.0	work load_i: 120.0	work load gap_i: 0	
165	V_id: 5	li: 9.0	xi: 25.5	bow of i: 21	.0 tail of i: 30.0	gama_i0: 3.0	gama_i1: 7
.0		duration_time_i: 4.0	deman	d_i: 140.0	work load_i: 140.0	work load gap_i: 0	
166	V_id: 6	li: 8.0	xi: 4.0	bow of i: 0.0	tail of i: 8.0	gama_i0: 4.0	gama_i1: 6.0
		duration_time_i: 2.0	demand_	i: 100.0	work load_i: 100.0	work load gap_i: 0	
167	V_id: 7	li: 5.0	xi: 2.5	bow of i: 0.0	tail of i: 5.0	gama_i0: 1.0	gama_i1: 3.0
		duration_time_i: 2.0	demand_	i: 120.0	work load_i: 120.0	work load gap_i: 0	
168	V_id: 8	li: 5.0	xi: 15.0	bow of i: 12	.5 tail of i: 17.5	gama_i0: 2.0	gama_i1: 4
.0		duration_time_i: 2.0	deman	d_i: 120.0	work load_i: 120.0	work load gap_i: 0	
169							

170 Algorithm finished and the total CPU time: 1230 s 171 End 172