```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=55907
 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'])
 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_9_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 = 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] = 28.80 temp_best_value_gen = 28.80
36
         The No. 0 iteration is finished!
37
38
39
     Beging the No. 1 iteration:
         obj[gen-1] = 28.80 temp_best_value_gen = 26.90
40
         Yes, update solution and obj[gen] = 26.90
41
42
         solution chromosome =
43
             first level: [ [ 1.5 6.5 12. 15.5 19.5 3.5 26.5 25.5 3. ]
             second level: [3. 4. 2. 1. 0. 7. 6. 2. 1.]
44
45
            third level: [3. 5. 2. 2. 2. 2. 6. 4. 2.]]
46
         The No. 1 iteration is finished!
47
48
     Beging the No. 2 iteration:
obj[gen-1] = 26.90 temp_best_value_gen = 26.90
49
50
         No, maintain solution and obj[gen] = 26.90, and the tolerance_counter = 1
51
         solution chromosome =
52
             first level: [ [ 1.5 6.5 12. 15.5 19.5 3.5 26.5 25.5 3. ]
53
             second level: [3. 4. 2. 1. 0. 7. 6. 2. 1.]
54
            third level: [3. 5. 2. 2. 2. 2. 6. 4. 2.]]
55
         The No. 2 iteration is finished!
56
57
     Beging the No. 3 iteration:
58
         obi[gen-1] = 26.90 temp best value gen = 26.90
59
         No, maintain solution and obj[gen] = 26.90, and the tolerance_counter = 2
60
         solution chromosome =
61
             first level: [ [ 1.5 6.5 12. 15.5 19.5 3.5 26.5 25.5 3. ]
62
             second level: [3. 4. 2. 1. 0. 7. 6. 2. 1.]
            third level: [3. 5. 2. 2. 2. 2. 6. 4. 2.]]
63
         The No. 3 iteration is finished!
64
65
     Beging the No. 4 iteration:
66
67
         obj[gen-1] = 26.90 temp\_best\_value\_gen = 26.90
68
         No, maintain solution and obj[gen] = 26.90, and the tolerance_counter = 3
69
         solution chromosome =
70
             first level: [ [ 1.5 6.5 12. 15.5 19.5 3.5 26.5 25.5 3. ]
71
             second level: [3. 4. 2. 1. 0. 7. 6. 2. 1.]
            third level: [3. 5. 2. 2. 2. 2. 6. 4. 2.]]
73
         The No. 4 iteration is finished!
74
75
    Beging the No. 5 iteration:
         obi[gen-1] = 26.90 temp best value gen = 26.90
76
         No, maintain solution and obj[gen] = 26.90, and the tolerance_counter = 4
77
78
         solution chromosome =
             first level: [ [ 1.5 6.5 12. 15.5 19.5 3.5 26.5 25.5 3. ]
```

```
second level: [3. 4. 2. 1. 0. 7. 6. 2. 1.]
 80
          third level: [3. 5. 2. 2. 2. 2. 6. 4. 2.]]
 81
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 84
 85
        obj[gen-1] = 26.90 temp best value gen = 26.90
        No, maintain solution and obj[gen] = 26.90, and the tolerance_counter = 5
 86
 87
        solution chromosome =
 88
          first level: [ [ 1.5 6.5 12. 15.5 19.5 3.5 26.5 25.5 3. ]
 89
          second level: [3. 4. 2. 1. 0. 7. 6. 2. 1.]
 90
          third level: [3. 5. 2. 2. 2. 2. 6. 4. 2.]]
 91
        The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
        obj[gen-1] = 26.90 temp_best_value_gen = 26.90
 94
 95
        No, maintain solution and obj[gen] = 26.90, and the tolerance_counter = 6
 96
        solution chromosome =
 97
          first level: [ [ 1.5 6.5 12. 15.5 19.5 3.5 26.5 25.5 3. ]
 98
          second level: [3. 4. 2. 1. 0. 7. 6. 2. 1.]
 99
          third level: [3. 5. 2. 2. 2. 2. 6. 4. 2.]]
100
        The No. 7 iteration is finished!
101
     Beging the No. 8 iteration:
102
        obj[gen-1] = 26.90 temp best value gen = 26.90
103
104
        No, maintain solution and obj[gen] = 26.90, and the tolerance_counter = 7
105
        solution chromosome =
          first level: [ [ 1.5 6.5 12. 15.5 19.5 3.5 26.5 25.5 3. ]
106
          second level: [3. 4. 2. 1. 0. 7. 6. 2. 1.]
107
108
          third level: [3. 5. 2. 2. 2. 2. 6. 4. 2.]]
109
        The No. 8 iteration is finished!
110
     Beging the No. 9 iteration:
111
112
        obj[gen-1] = 26.90 temp\_best\_value\_gen = 26.90
113
        No, maintain solution and obj[gen] = 26.90, and the tolerance_counter = 8
114
        solution chromosome =
          first level: [ [ 1.5 6.5 12. 15.5 19.5 3.5 26.5 25.5 3. ]
115
116
          second level: [3. 4. 2. 1. 0. 7. 6. 2. 1.]
          third level: [3. 5. 2. 2. 2. 2. 6. 4. 2.]]
117
118
        The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
        obj[gen-1] = 26.90 temp_best_value_gen = 26.90
122
        No, maintain solution and obj[gen] = 26.90, and the tolerance_counter = 9
123
        solution chromosome =
124
          first level: [ [ 1.5 6.5 12. 15.5 19.5 3.5 26.5 25.5 3. ]
125
          second level: [3. 4. 2. 1. 0. 7. 6. 2. 1.]
126
          third level: [3. 5. 2. 2. 2. 2. 6. 4. 2.]]
127
        The No. 10 iteration is finished!
128
129
     Beging the No. 11 iteration:
        obj[gen-1] = 26.90 temp best value gen = 26.90
130
131
        No, maintain solution and obj[gen] = 26.90, and the tolerance_counter = 10
132
        solution chromosome =
          first level: [ [ 1.5 6.5 12. 15.5 19.5 3.5 26.5 25.5 3. ]
133
134
          second level: [3. 4. 2. 1. 0. 7. 6. 2. 1.]
135
          third level: [3. 5. 2. 2. 2. 2. 6. 4. 2.]]
136
        The No. 11 iteration is finished!
137
138
139
140 The iteration is terminated and then visulize the solution:
141
        solution chromosome =
          first level: [ [ 1.5 6.5 12. 15.5 19.5 3.5 26.5 25.5 3. ]
142
143
          second level: [3. 4. 2. 1. 0. 7. 6. 2. 1.]
          third level: [3. 5. 2. 2. 2. 2. 6. 4. 2.]]
144
145
        Objective function values and some other indicators:
                                                        Obj0 + Obj1 = 107.00
146
          Obj0 = 9.00
                                 Obj1 = 98.00
          Total movement of crane: 72.00
147
148
          Total waiting time in berth position: 26.00
149
          Total index of q during berthing: 590.00
150
        Specific arrangement for each vessel:
151
           V_id: 0
                               li: 3.0
                                                   xi: 1.5
                                                                       bow of i: 0.0
                                                                                                   tail of i: 3.0
                                                                                                                             gama_i0: 3.0
                                                                                                                                                         gama_i1: 4.0
                     duration_time_i: 1.0
                                                        demand_i: 60.0
                                                                                       work load i: 60.0
                                                                                                                        work load gap_i: 0
152
           V id: 1
                              li: 7.0
                                                   xi: 6.5
                                                                       bow of i: 3.0
                                                                                                   tail of i: 10.0
                                                                                                                               gama i0: 4.0
                                                                                                                                                           gama i1: 5.0
                                                        demand i: 80.0
                                                                                       work load_i: 80.0
                     duration_time_i: 1.0
                                                                                                                        work load gap_i: 0
153
           V id: 2
                              li: 4.0
                                                   xi: 12.0
                                                                          bow of i: 10.0
                                                                                                      tail of i: 14.0
                                                                                                                                  gama i0: 2.0
                                                                                                                                                              gama i1:6
     .0
                       duration_time_i: 4.0
                                                           demand_i: 160.0
                                                                                         work load_i: 160.0
                                                                                                                          work load gap_i: 0
          V_id: 3
                                                                                                                                  gama_i0: 1.0
154
                                                   xi: 15.5
                                                                          bow of i: 14.0
                                                                                                      tail of i: 17.0
                                                                                                                                                              gama_i1: 4
                              li: 3.0
                       duration_time_i: 3.0
                                                           demand_i: 100.0
                                                                                         work load_i: 100.0
     .0
                                                                                                                          work load gap_i: 0
                                                                                                                                  gama_i0: 0.0
155
           V id: 4
                               li: 5.0
                                                   xi: 19.5
                                                                          bow of i: 17.0
                                                                                                      tail of i: 22.0
                                                                                                                                                              gama_i1: 3
                                                           demand i: 120.0
                                                                                         work load i: 120.0
                                                                                                                          work load gap i: 0
     .0
                       duration time i: 3.0
156
           V id: 5
                                                                                                                            gama i0: 7.0
                                                                                                                                                         gama i1: 10.0
                              li: 7.0
                                                                       bow of i: 0.0
                                                                                                   tail of i: 7.0
                     duration_time_i: 3.0
                                                        demand_i: 120.0
                                                                                       work load_i: 120.0
                                                                                                                        work load gap_i: 0
157
           V id: 6
                                                   xi: 26.5
                                                                          bow of i: 23.0
                                                                                                      tail of i: 30.0
                                                                                                                                  gama i0: 6.0
                                                                                                                                                              gama_i1: 8
                               1i: 7.0
```

.0 duration_time_i: 2.0 demand_i: 160.0 work load_i: 160.0 work load_gap_i: 0 9 V_id: 8 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: 80.0 work load_i: 80.0 work load gap_i: 0 0 1 Algorithm finished and the total CPU time: 1123 s 2 End	nknov									
duration_time_i: 2.0 demand_i: 80.0 work load_i: 80.0 work load_gap_i: 0  Algorithm finished and the total CPU time: 1123 s  End	57 .	.0	x7 · ·	_	duration_time_i: 2.0	demand_i	: 140.0	work load_i: 140.0	work load gap_i: 0	
duration_time_i: 2.0 demand_i: 80.0 work load_i: 80.0 work load_gap_i: 0  Algorithm finished and the total CPU time: 1123 s  End	158	.0			duration time i: 2.0	XI: 25.5 demand i	bow of 1: 2: : 160.0	2.5 tail of 1: 28.5 work load i: 160.0	gama_10: 2.0 work load gap i: 0	
0 1 Algorithm finished and the total CPU time: 1123 s 2 End	159		V_id:	8	li: 6.0 duration time i: 2.0	xi: 3.0 demand i: 8	bow of i: 0.0	tail of i: 6.0 work load i: 80.0	gama_i0: 1.0 work load gap i: 0	gama_i1: 3.0
2 End	60	Algo	rithm t					_	0.1=	
	[62]	Aigo End	111111111	111111	shed and the total CI O ti	ilic. 1125 s				
	163									