```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=55346
2
3
   import sys; print('Python %s on %s' % (sys.version, sys.platform))
   01 My Python Code', 'E:/1 0000/3 00000/1 000000/1 0000000/1 000000 0000/1 LW 00002/6 0000/2 python code/
   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_4 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] = 34.53 temp_best_value_gen = 34.53
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 34.53 temp_best_value_gen = 34.53
40
     No, maintain solution and obj[gen] = 34.53, and the tolerance_counter = 1
41
42
     solution chromosome =
43
       first level: [ [2.32 6.2 4.22 2.7 6.87 2.31 3.08 3.91 4.57]
       second level: [4. 1. 2. 0. 6. 8. 3. 10. 12.]
44
       third level: [2. 9. 5. 5. 4. 2. 5. 7. 2.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
obj[gen-1] = 34.53 temp_best_value_gen = 34.53
49
50
     No, maintain solution and obj[gen] = 34.53, and the tolerance_counter = 2
51
     solution chromosome =
       first level: [ [2.32 6.2 4.22 2.7 6.87 2.31 3.08 3.91 4.57]
52
53
       second level: [4. 1. 2. 0. 6. 8. 3. 10. 12.]
54
       third level: [2. 9. 5. 5. 4. 2. 5. 7. 2.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 34.53 temp best value gen = 34.53
59
     No, maintain solution and obj[gen] = 34.53, and the tolerance_counter = 3
60
     solution chromosome =
61
       first level: [ [2.32 6.2 4.22 2.7 6.87 2.31 3.08 3.91 4.57]
62
       second level: [4. 1. 2. 0. 6. 8. 3. 10. 12.]
       third level: [2. 9. 5. 5. 4. 2. 5. 7. 2.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 34.53 temp_best_value_gen = 34.53
68
     No, maintain solution and obj[gen] = 34.53, and the tolerance_counter = 4
69
     solution chromosome =
70
       first level: [ [2.32 6.2 4.22 2.7 6.87 2.31 3.08 3.91 4.57]
       second level: [4. 1. 2. 0. 6. 8. 3. 10. 12.]
71
       third level: [2. 9. 5. 5. 4. 2. 5. 7. 2.]]
73
     The No. 4 iteration is finished!
74
75
  Beging the No. 5 iteration:
     obi[gen-1] = 34.53 temp best value gen = 34.53
76
     No, maintain solution and obj[gen] = 34.53, and the tolerance_counter = 5
77
     solution chromosome =
78
       first level: [ [2.32 6.2 4.22 2.7 6.87 2.31 3.08 3.91 4.57]
```

```
second level: [4. 1. 2. 0. 6. 8. 3. 10. 12.]
 80
          third level: [2. 9. 5. 5. 4. 2. 5. 7. 2.]]
 81
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 85
       obj[gen-1] = 34.53 temp best value gen = 34.53
       No, maintain solution and obj[gen] = 34.53, and the tolerance_counter = 6
 86
 87
        solution chromosome =
 88
          first level: [ [2.32 6.2 4.22 2.7 6.87 2.31 3.08 3.91 4.57]
          second level: [4. 1. 2. 0. 6. 8. 3. 10. 12.]
 89
 90
          third level: [2. 9. 5. 5. 4. 2. 5. 7. 2.]]
 91
        The No. 6 iteration is finished!
 92
 93
     Beging the No. 7 iteration:
 94
        obj[gen-1] = 34.53 temp_best_value_gen = 34.53
 95
        No, maintain solution and obj[gen] = 34.53, and the tolerance_counter = 7
 96
       solution chromosome =
 97
          first level: [ [2.32 6.2 4.22 2.7 6.87 2.31 3.08 3.91 4.57]
 98
          second level: [4. 1. 2. 0. 6. 8. 3. 10. 12.]
 99
          third level: [2. 9. 5. 5. 4. 2. 5. 7. 2.]]
100
        The No. 7 iteration is finished!
101
     Beging the No. 8 iteration:
102
       obj[gen-1] = 34.53 temp best value gen = 34.53
103
104
       No, maintain solution and obj[gen] = 34.53, and the tolerance_counter = 8
105
        solution chromosome =
          first level: [ [2.32 6.2 4.22 2.7 6.87 2.31 3.08 3.91 4.57]
106
          second level: [4. 1. 2. 0. 6. 8. 3. 10. 12.]
107
          third level: [2. 9. 5. 5. 4. 2. 5. 7. 2.]]
108
109
        The No. 8 iteration is finished!
110
     Beging the No. 9 iteration:
111
112
        obj[gen-1] = 34.53 temp_best_value_gen = 34.53
        No, maintain solution and obj[gen] = 34.53, and the tolerance_counter = 9
113
114
       solution chromosome =
115
          first level: [ [2.32 6.2 4.22 2.7 6.87 2.31 3.08 3.91 4.57]
116
          second level: [4. 1. 2. 0. 6. 8. 3. 10. 12.]
          third level: [2. 9. 5. 5. 4. 2. 5. 7. 2.]]
117
118
        The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
       obj[gen-1] = 34.53 temp_best_value_gen = 34.53
122
       No, maintain solution and obj[gen] = 34.53, and the tolerance_counter = 10
123
        solution chromosome =
124
          first level: [ [2.32 6.2 4.22 2.7 6.87 2.31 3.08 3.91 4.57]
125
          second level: [4. 1. 2. 0. 6. 8. 3. 10. 12.]
126
          third level: [2. 9. 5. 5. 4. 2. 5. 7. 2.]]
127
        The No. 10 iteration is finished!
128
129
130
131 The iteration is terminated and then visulize the solution:
132
       solution chromosome =
          first level: [ [2.32 6.2 4.22 2.7 6.87 2.31 3.08 3.91 4.57]
133
134
          second level: [4. 1. 2. 0. 6. 8. 3. 10. 12.]
135
          third level: [2. 9. 5. 5. 4. 2. 5. 7. 2.]]
136
        Objective function values and some other indicators:
                                                       Obj0 + Obj1 = 93.26
137
          Obi0 = 14.00
                                Obj1 = 79.26
138
          Total movement of crane: 33.26
139
          Total waiting time in berth position: 46.00
140
          Total index of q during berthing: 107.00
141
        Specific arrangement for each vessel:
                                                                                                                           gama i0: 4.0
142
          V_id: 0
                             li: 3.0
                                                  xi: 2.3
                                                                      bow of i: 0.8
                                                                                                  tail of i: 3.8
                                                                                                                                                       gama i1: 6.0
                    duration_time_i: 2.0
                                                       demand_i: 80.0
                                                                                      work load_i: 80.0
                                                                                                                      work load gap_i: 0
143
          V_id: 1
                              li: 9.0
                                                   xi: 6.2
                                                                      bow of i: 1.7
                                                                                                  tail of i: 10.7
                                                                                                                              gama_i0: 1.0
                                                                                                                                                          gama_i1: 2.0
                                                                                      work load_i: 140.0
                                                                                                                      work load gap_i: 0
                    duration_time_i: 1.0
                                                       demand_i: 140.0
144
          V id: 2
                                                  xi: 4.2
                                                                      bow of i: 1.7
                                                                                                  tail of i: 6.7
                                                                                                                           gama i0: 2.0
                                                                                                                                                       gama_i1: 3.0
                              li: 5.0
                                                       demand_i: 80.0
                                                                                      work load i: 80.0
                                                                                                                      work load gap_i: 0
                    duration_time_i: 1.0
145
          V id: 3
                              li: 5.0
                                                  xi: 2.7
                                                                      bow of i: 0.2
                                                                                                  tail of i: 5.2
                                                                                                                           gama_i0: 0.0
                                                                                                                                                       gama i1: 1.0
                                                       demand_i: 80.0
                                                                                                                      work load gap_i: 0
                    duration_time_i: 1.0
                                                                                      work load_i: 80.0
146
          V_id: 4
                                                                                                  tail of i: 11.4
                                                                                                                              gama_i0: 6.0
                              1i: 9.0
                                                                      bow of i: 2.4
                                                                                                                                                          gama_i1: 8.0
                                                  xi: 6.9
                                                                                      work load_i: 100.0
                                                                                                                      work load gap_i: 0
                    duration_time_i: 2.0
                                                       demand_i: 100.0
147
          V_id: 5
                                                                      bow of i: 0.8
                                                                                                  tail of i: 3.8
                                                                                                                           gama_i0: 8.0
                                                                                                                                                       gama_i1: 10.0
                              li: 3.0
                                                  xi: 2.3
                    duration\_time\_i{:}~2.0
                                                       demand i: 80.0
                                                                                      work load i: 80.0
                                                                                                                      work load gap i: 0
148
          V id: 6
                                                                      bow of i: 0.6
                                                                                                  tail of i: 5.6
                              li: 5.0
                                                  xi: 3.1
                                                                                                                           gama_i0: 3.0
                                                                                                                                                       gama_i1: 4.0
                    duration time i: 1.0
                                                       demand i: 100.0
                                                                                      work load i: 100.0
                                                                                                                      work load gap i: 0
149
          V_id: 7
                              li: 7.0
                                                  xi: 3.9
                                                                      bow of i: 0.4
                                                                                                  tail of i: 7.4
                                                                                                                           gama_i0: 10.0
                                                                                                                                                       gama_i1: 12.0
                                                       demand_i: 160.0
                    duration_time_i: 2.0
                                                                                      work load_i: 160.0
                                                                                                                      work load gap_i: 0
150
                                                                      bow of i: 2.1
                                                                                                  tail of i: 7.1
          V id: 8
                              li: 5.0
                                                  xi: 4.6
                                                                                                                           gama_i0: 12.0
                                                                                                                                                       gama_i1: 15.0
                    duration_time_i: 3.0
                                                       demand i: 100.0
                                                                                      work load i: 100.0
                                                                                                                      work load gap_i: 0
152 Algorithm finished and the total CPU time: 1035 s
153 End
154
```