```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=51527
 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_17_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 = 51
            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] = 78.40 temp_best_value_gen = 78.40
36
         The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
         obj[gen-1] = 78.40 temp_best_value_gen = 78.40
40
         No, maintain solution and obj[gen] = 78.40, and the tolerance_counter = 1
41
42
         solution chromosome =
43
             first level: [ [ 4.5 13. 18.5 22.5 25.5 4. 2. 3. 2.5 2. 2. 2.5 1.5 4.5
44
       3.5 2.5 2.5]
45
             second level: [ 6. 5. 7. 0. 4. 1. 3. 8. 10. 12. 14. 16. 18. 20. 21. 25. 28.]
            third level: [5. 6. 3. 5. 4. 4. 3. 3. 4. 2. 3. 4. 2. 8. 2. 3. 2.]]
46
47
         The No. 1 iteration is finished!
48
     Beging the No. 2 iteration:
49
50
         obj[gen-1] = 78.40 temp_best_value_gen = 78.40
51
         No, maintain solution and obj[gen] = 78.40, and the tolerance_counter = 2
52
         solution chromosome =
53
             first level: [ [ 4.5 13. 18.5 22.5 25.5 4. 2. 3. 2.5 2. 2. 2.5 1.5 4.5
54
       3.5 2.5 2.5]
55
            second level: [6. 5. 7. 0. 4. 1. 3. 8. 10. 12. 14. 16. 18. 20. 21. 25. 28.]
             third level: [5. 6. 3. 5. 4. 4. 3. 3. 4. 2. 3. 4. 2. 8. 2. 3. 2.]]
56
57
         The No. 2 iteration is finished!
58
59 Beging the No. 3 iteration:
         obj[gen-1] = 78.40 temp_best_value_gen = 78.40
60
         No, maintain solution and obj[gen] = 78.40, and the tolerance_counter = 3
61
62
         solution chromosome =
            first level: [ [ 4.5 13. 18.5 22.5 25.5 4. 2. 3. 2.5 2. 2. 2.5 1.5 4.5
63
64
       3.5 2.5 2.51
            second level: [ 6. 5. 7. 0. 4. 1. 3. 8. 10. 12. 14. 16. 18. 20. 21. 25. 28.]
65
            third level: [5. 6. 3. 5. 4. 4. 3. 3. 4. 2. 3. 4. 2. 8. 2. 3. 2.]]
66
67
         The No. 3 iteration is finished!
68
69 Beging the No. 4 iteration:
         obj[gen-1] = 78.40 temp\_best\_value\_gen = 78.40
70
71
         No, maintain solution and obj[gen] = 78.40, and the tolerance_counter = 4
         solution chromosome
73
             first level: [ [ 4.5 13. 18.5 22.5 25.5 4. 2. 3. 2.5 2. 2. 2.5 1.5 4.5
74
75
             second level: [ 6. 5. 7. 0. 4. 1. 3. 8. 10. 12. 14. 16. 18. 20. 21. 25. 28.]
             third level: [5. 6. 3. 5. 4. 4. 3. 3. 4. 2. 3. 4. 2. 8. 2. 3. 2.]]
76
         The No. 4 iteration is finished!
77
78
     Beging the No. 5 iteration:
79
```

```
obj[gen-1] = 78.40 temp_best_value_gen = 78.40
 80
 81
       No, maintain solution and obj[gen] = 78.40, and the tolerance_counter = 5
 82
       solution chromosome =
 83
          first level: [ [ 4.5 13. 18.5 22.5 25.5 4. 2. 3. 2.5 2. 2. 2.5 1.5 4.5
      3.5 2.5 2.51
 85
          second level: [6. 5. 7. 0. 4. 1. 3. 8. 10. 12. 14. 16. 18. 20. 21. 25. 28.]
 86
          third level: [5. 6. 3. 5. 4. 4. 3. 3. 4. 2. 3. 4. 2. 8. 2. 3. 2.]]
 87
       The No. 5 iteration is finished!
 88
 89
     Beging the No. 6 iteration:
 90
       obj[gen-1] = 78.40 temp_best_value_gen = 78.40
 91
        No, maintain solution and obj[gen] = 78.40, and the tolerance_counter = 6
 92
       solution chromosome =
 93
          first level: [ [ 4.5 13. 18.5 22.5 25.5 4. 2. 3. 2.5 2. 2. 2.5 1.5 4.5
 94
      3.5 2.5 2.5]
 95
          second level: [6. 5. 7. 0. 4. 1. 3. 8. 10. 12. 14. 16. 18. 20. 21. 25. 28.]
          third level: [5. 6. 3. 5. 4. 4. 3. 3. 4. 2. 3. 4. 2. 8. 2. 3. 2.]]
 96
 97
       The No. 6 iteration is finished!
 98
 99
     Beging the No. 7 iteration:
       obj[gen-1] = 78.40 temp_best_value_gen = 78.40
100
101
        No, maintain solution and obj[gen] = 78.40, and the tolerance_counter = 7
102
        solution chromosome =
          first level: [ [ 4.5 13. 18.5 22.5 25.5 4. 2. 3. 2.5 2. 2. 2.5 1.5 4.5
103
104
      3.5 2.5 2.5]
105
          second level: [ 6. 5. 7. 0. 4. 1. 3. 8. 10. 12. 14. 16. 18. 20. 21. 25. 28.]
          third level: [5. 6. 3. 5. 4. 4. 3. 3. 4. 2. 3. 4. 2. 8. 2. 3. 2.]]
106
        The No. 7 iteration is finished!
107
108
109
110
    The iteration is terminated and then visulize the solution:
111
112
        solution chromosome =
          first level: [ [ 4.5 13. 18.5 22.5 25.5 4. 2. 3. 2.5 2. 2. 2.5 1.5 4.5
113
114
      3.5 2.5 2.51
          second level: [ 6. 5. 7. 0. 4. 1. 3. 8. 10. 12. 14. 16. 18. 20. 21. 25. 28.]
115
          third level: [5. 6. 3. 5. 4. 4. 3. 3. 4. 2. 3. 4. 2. 8. 2. 3. 2.]]
116
117
        Objective function values and some other indicators:
                                 Obj1 = 214.00
          Obi0 = 30.00
                                                          Obj0 + Obj1 = 244.00
118
119
          Total movement of crane: 16.00
120
          Total waiting time in berth position: 198.00
121
          Total index of q during berthing: 464.00
122
        Specific arrangement for each vessel:
123
          V_id: 0
                              li: 9.0
                                                   xi: 4.5
                                                                       bow of i: 0.0
                                                                                                   tail of i: 9.0
                                                                                                                            gama i0: 6.0
                                                                                                                                                        gama i1: 8.0
                    duration_time_i: 2.0
                                                        demand_i: 140.0
                                                                                      work load_i: 140.0
                                                                                                                       work load gap_i: 0
124
          V_id: 1
                              1i: 8.0
                                                                         bow of i: 9.0
                                                                                                     tail of i: 17.0
                                                                                                                                 gama i0: 5.0
                                                                                                                                                             gama_i1: 6
                                                   xi: 13.0
     .0
                       duration_time_i: 1.0
                                                          demand_i: 100.0
                                                                                         work load_i: 100.0
                                                                                                                          work load gap_i: 0
                                                                                                     tail of i: 20.0
125
          V_id: 2
                              li: 3.0
                                                   xi: 18.5
                                                                         bow of i: 17.0
                                                                                                                                 gama_i0: 7.0
                                                                                                                                                             gama_i1:
     10.0
                         duration time i: 3.0
                                                            demand i: 160.0
                                                                                           work load i: 160.0
                                                                                                                            work load gap_i: 0
126
          V_id: 3
                                                  xi: 22.5
                              li: 5.0
                                                                         bow of i: 20.0
                                                                                                     tail of i: 25.0
                                                                                                                                 gama_i0: 0.0
                                                                                                                                                             gama_i1: 1
     .0
                       duration time i: 1.0
                                                          demand i: 60.0
                                                                                         work load i: 60.0
                                                                                                                          work load gap i: 0
127
                              li: 9.0
          V_id: 4
                                                  xi: 25.5
                                                                         bow of i: 21.0
                                                                                                     tail of i: 30.0
                                                                                                                                 gama_i0: 4.0
                                                                                                                                                             gama_i1: 6
                                                                                         work load i: 120.0
                                                                                                                         work load gap_i: 0
     .0
                       duration time i: 2.0
                                                          demand i: 120.0
                                                   xi: 4.0
128
          V_id: 5
                              1i: 8.0
                                                                       bow of i: 0.0
                                                                                                   tail of i: 8.0
                                                                                                                            gama_i0: 1.0
                                                                                                                                                        gama_i1: 3.0
                                                        demand_i: 140.0
                                                                                      work load i: 140.0
                                                                                                                       work load gap_i: 0
                    duration_time_i: 2.0
129
          V id: 6
                              li: 4.0
                                                   xi: 2.0
                                                                       bow of i: 0.0
                                                                                                   tail of i: 4.0
                                                                                                                            gama i0: 3.0
                                                                                                                                                        gama i1: 6.0
                                                        demand\_i{:}\ 140.0
                                                                                      work load i: 140.0
                                                                                                                       work load gap i: 0
                    duration time i: 3.0
                                                                       bow of i: 0.0
130
          V_id: 7
                              li: 6.0
                                                   xi: 3.0
                                                                                                   tail of i: 6.0
                                                                                                                            gama_i0: 8.0
                                                                                                                                                        gama_i1: 10.0
                                                        demand_i: 80.0
                    duration_time_i: 2.0
                                                                                      work load_i: 80.0
                                                                                                                       work load gap_i: 0
131
          V_id: 8
                                                                                                   tail of i: 5.0
                                                                                                                                                        gama_i1: 12.0
                              li: 5.0
                                                   xi: 2.5
                                                                       bow of i: 0.0
                                                                                                                            gama i0: 10.0
                                                                                                                       work load gap_i: 0
                    duration_time_i: 2.0
                                                        demand i: 160.0
                                                                                      work load_i: 160.0
132
          V id: 9
                                                   xi: 2.0
                                                                       bow of i: 0.0
                                                                                                   tail of i: 4.0
                                                                                                                            gama i0: 12.0
                              li: 4.0
                                                                                                                                                        gama i1: 14.0
                                                        demand i: 80.0
                    duration time i: 2.0
                                                                                      work load i: 80.0
                                                                                                                       work load gap i: 0
133
          V_id: 10
                                                                         bow of i: 0.0
                                                                                                                              gama_i0: 14.0
                                li: 4.0
                                                     xi: 2.0
                                                                                                     tail of i: 4.0
                                                                                                                                                          gama i1: 16.
     0
                    duration_time_i: 2.0
                                                        demand_i: 80.0
                                                                                      work load_i: 80.0
                                                                                                                       work load gap_i: 0
134
                                                                         bow of i: 0.0
                                 li: 5.0
                                                     xi: 2.5
                                                                                                     tail of i: 5.0
                                                                                                                              gama_i0: 16.0
                                                                                                                                                           gama_i1: 18.
     0
                                                       demand i: 160.0
                                                                                                                       work load gap i: 0
                    duration time i: 2.0
                                                                                      work load i: 160.0
135
          V_id: 12
                                 li: 3.0
                                                     xi: 1.5
                                                                         bow of i: 0.0
                                                                                                     tail of i: 3.0
                                                                                                                              gama_i0: 18.0
                                                                                                                                                           gama_i1: 20.
     0
                    duration_time_i: 2.0
                                                        demand i: 80.0
                                                                                      work load_i: 80.0
                                                                                                                       work load gap i: 0
136
          V_id: 13
                                li: 9.0
                                                     xi: 4.5
                                                                         bow of i: 0.0
                                                                                                     tail of i: 9.0
                                                                                                                              gama_i0: 20.0
                                                                                                                                                           gama_i1: 21.
     0
                                                       demand_i: 80.0
                                                                                      work load_i: 80.0
                    duration time i: 1.0
                                                                                                                       work load gap i: 0
137
          V_id: 14
                                 li: 7.0
                                                     xi: 3.5
                                                                         bow of i: 0.0
                                                                                                     tail of i: 7.0
                                                                                                                              gama_i0: 21.0
                                                                                                                                                           gama_i1: 25.
     0
                                                                                                                       work load gap_i: 0
                    duration_time_i: 4.0
                                                        demand_i: 140.0
                                                                                      work load i: 140.0
                                                     xi: 2.5
138
          V id: 15
                                 li: 5.0
                                                                         bow of i: 0.0
                                                                                                     tail of i: 5.0
                                                                                                                              gama i0: 25.0
                                                                                                                                                          gama i1: 28.
                                                       demand_i: 160.0
     0
                    duration_time_i: 3.0
                                                                                      work load_i: 160.0
                                                                                                                       work load gap_i: 0
139
          V id: 16
                                 li: 5.0
                                                     xi: 2.5
                                                                         bow of i: 0.0
                                                                                                     tail of i: 5.0
                                                                                                                              gama i0: 28.0
                                                                                                                                                           gama i1: 31.
     0
                    duration_time_i: 3.0
                                                        demand_i: 100.0
                                                                                      work load_i: 100.0
                                                                                                                       work load gap_i: 0
140
     Algorithm finished and the total CPU time: 1336 s
141
142
     End
143
```