```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=45282
 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.
 8 Python 3.9.7 (tags/v3.9.7:1016ef3, Aug 30 2021, 20:19:38) [MSC v.1929 64 bit (AMD64)] on win32
     python code/01_My_Python_Code')
10 Backend TkAgg is interactive backend. Turning interactive mode on.
     Waiting 1s....
12
13
     This is the R_18_9 standard_test.xlsx optimization process solved by ENSGA-II algorithm.
14
15
     Start
16
17 Before iteration:
18
         Read basic data
19
         Parameter setting:
20
            trail = 58
21
            Pop_size = 30
            Tolerance iteration unchanged number = 10
23
            Chrom size = 54
            Iter_num_GA = 300
24
25
            Select_rate = 0.85
26
            Crossover rate = 0.95
            Mutation rate = 0.95
27
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] = 93.50 temp_best_value_gen = 93.50
36
         The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
         obj[gen-1] = 93.50 temp_best_value_gen = 93.50
40
         No, maintain solution and obj[gen] = 93.50, and the tolerance_counter = 1
41
42
         solution chromosome =
43
            first level: [ [ 5.88 4.4 3.48 1.85 6.84 5.89 2.07 3.54 8.8 3.71 7.5 3.15
       2.28 12. 9.5 4.64 10.5 10.5 ]
44
45
            second level: [ 6. 1. 4. 8. 12. 13. 15. 16. 10. 27. 8. 29. 31. 4. 1. 19. 15. 22.]
46
            third level: [3. 3. 3. 2. 6. 5. 3. 3. 3. 3. 6. 3. 2. 1. 1. 2. 3. 2.]
47
         The No. 1 iteration is finished!
48
     Beging the No. 2 iteration:
49
50
         obj[gen-1] = 93.50 temp_best_value_gen = 93.50
         No, maintain solution and obj[gen] = 93.50, and the tolerance counter = 2
51
52
         solution chromosome =
53
            first level: [ [ 5.88 4.4 3.48 1.85 6.84 5.89 2.07 3.54 8.8 3.71 7.5 3.15
54
       2.28 12. 9.5 4.64 10.5 10.5 ]
55
            second level: [ 6. 1. 4. 8. 12. 13. 15. 16. 10. 27. 8. 29. 31. 4. 1. 19. 15. 22.]
            third level: [3. 3. 3. 2. 6. 5. 3. 3. 3. 3. 6. 3. 2. 1. 1. 2. 3. 2.]]
56
57
         The No. 2 iteration is finished!
58
59 Beging the No. 3 iteration:
         obj[gen-1] = 93.50 temp_best_value_gen = 93.50
60
         No, maintain solution and obj[gen] = 93.50, and the tolerance_counter = 3
61
62
         solution chromosome =
            first level: [ [ 5.88 4.4 3.48 1.85 6.84 5.89 2.07 3.54 8.8 3.71 7.5 3.15
63
       2.28 12. 9.5 4.64 10.5 10.5 ]
64
            second level: [ 6. 1. 4. 8. 12. 13. 15. 16. 10. 27. 8. 29. 31. 4. 1. 19. 15. 22.]
65
            third level: [3. 3. 3. 2. 6. 5. 3. 3. 3. 3. 6. 3. 2. 1. 1. 2. 3. 2.]]
66
67
         The No. 3 iteration is finished!
68
69 Beging the No. 4 iteration:
         obj[gen-1] = 93.50 temp_best_value_gen = 93.50
70
71
         No, maintain solution and obj[gen] = 93.50, and the tolerance counter = 4
         solution chromosome
            first level: [ [ 5.88 4.4 3.48 1.85 6.84 5.89 2.07 3.54 8.8 3.71 7.5 3.15
73
       2.28\ 12.\quad 9.5\quad 4.64\ 10.5\ \ 10.5\ ]
74
75
            second level: [ 6. 1. 4. 8. 12. 13. 15. 16. 10. 27. 8. 29. 31. 4. 1. 19. 15. 22.]
            third level: [3. 3. 3. 2. 6. 5. 3. 3. 3. 3. 6. 3. 2. 1. 1. 2. 3. 2.]]
76
         The No. 4 iteration is finished!
77
78
     Beging the No. 5 iteration:
79
```

```
obj[gen-1] = 93.50 temp_best_value_gen = 93.50
 81
       No, maintain solution and obj[gen] = 93.50, and the tolerance counter = 5
 82
       solution chromosome =
 83
          first level: [ [ 5.88 4.4 3.48 1.85 6.84 5.89 2.07 3.54 8.8 3.71 7.5 3.15
      2.28 12. 9.5 4.64 10.5 10.5 ]
 85
          second level: [ 6. 1. 4. 8. 12. 13. 15. 16. 10. 27. 8. 29. 31. 4. 1. 19. 15. 22.]
 86
          third level: [3. 3. 3. 2. 6. 5. 3. 3. 3. 3. 6. 3. 2. 1. 1. 2. 3. 2.]]
 87
       The No. 5 iteration is finished!
 88
 89
     Beging the No. 6 iteration:
       obj[gen-1] = 93.50 temp_best_value_gen = 93.50
 90
 91
        No, maintain solution and obj[gen] = 93.50, and the tolerance_counter = 6
 92
       solution chromosome =
 93
          first level: [ [ 5.88 4.4 3.48 1.85 6.84 5.89 2.07 3.54 8.8 3.71 7.5 3.15
 94
      2.28 12. 9.5 4.64 10.5 10.5 ]
 95
          second level: [ 6. 1. 4. 8. 12. 13. 15. 16. 10. 27. 8. 29. 31. 4. 1. 19. 15. 22.]
 96
          third level: [3. 3. 3. 2. 6. 5. 3. 3. 3. 3. 6. 3. 2. 1. 1. 2. 3. 2.]]
 97
        The No. 6 iteration is finished!
 98
 99
100
101
    The iteration is terminated and then visulize the solution:
102
        solution chromosome =
          first level: [ [ 5.88 4.4 3.48 1.85 6.84 5.89 2.07 3.54 8.8 3.71 7.5 3.15
103
104
      2.28 12. 9.5 4.64 10.5 10.5 ]
105
          second level: [ 6. 1. 4. 8. 12. 13. 15. 16. 10. 27. 8. 29. 31. 4. 1. 19. 15. 22.]
          third level: [3. 3. 3. 2. 6. 5. 3. 3. 3. 3. 6. 3. 2. 1. 1. 2. 3. 2.]]
106
107
        Objective function values and some other indicators:
                                 Obj1 = 288.96
                                                          Obj0 + Obj1 = 322.96
108
          Obi0 = 34.00
109
          Total movement of crane: 47.96
110
          Total waiting time in berth position: 241.00
111
          Total index of q during berthing: 340.00
112
        Specific arrangement for each vessel:
                                                  xi: 5.9
113
          V_id: 0
                              li: 9.0
                                                                       bow of i: 1.4
                                                                                                   tail of i: 10.4
                                                                                                                              gama_i0: 6.0
                                                                                                                                                          gama_i1: 8.0
                    duration_time_i: 2.0
                                                        demand_i: 120.0
                                                                                      work load i: 120.0
                                                                                                                       work load gap i: 0
                                                                       bow of i: 0.9
114
          V_id: 1
                              li: 7.0
                                                   xi: 4.4
                                                                                                   tail of i: 7.9
                                                                                                                            gama_i0: 1.0
                                                                                                                                                        gama_i1: 4.0
                    duration_time_i: 3.0
                                                        demand i: 160.0
                                                                                      work load i: 160.0
                                                                                                                       work load gap i: 0
115
          V id: 2
                                                   xi: 3.5
                                                                       bow of i: 0.5
                                                                                                   tail of i: 6.5
                                                                                                                            gama i0: 4.0
                                                                                                                                                        gama i1: 6.0
                              li: 6.0
                                                                                                                       work load gap_i: 0
                    duration_time_i: 2.0
                                                        demand_i: 80.0
                                                                                      work load i: 80.0
                                                   xi: 1.8
116
          V_id: 3
                              li: 3.0
                                                                       bow of i: 0.3
                                                                                                   tail of i: 3.3
                                                                                                                            gama_i0: 8.0
                                                                                                                                                        gama_i1: 12.0
                                                                                      work load_i: 140.0
                                                        demand i: 140.0
                                                                                                                       work load gap_i: 0
                    duration_time_i: 4.0
117
          V id: 4
                              li: 8.0
                                                                       bow of i: 2.8
                                                                                                   tail of i: 10.8
                                                                                                                              gama i0: 12.0
                                                                                                                                                          gama i1: 13.
                                                   xi: 6.8
     0
                                                        demand_i: 80.0
                    duration_time_i: 1.0
                                                                                      work load i: 80.0
                                                                                                                       work load gap_i: 0
118
          V id: 5
                              li: 9.0
                                                   xi: 5.9
                                                                       bow of i: 1.4
                                                                                                   tail of i: 10.4
                                                                                                                              gama i0: 13.0
                                                                                                                                                          gama i1: 15.
                    duration_time_i: 2.0
                                                        demand_i: 140.0
                                                                                      work load_i: 140.0
                                                                                                                       work load gap_i: 0
119
                                                                                                                            gama i0: 15.0
          V_id: 6
                              li: 4.0
                                                   xi: 2.1
                                                                       bow of i: 0.1
                                                                                                   tail of i: 4.1
                                                                                                                                                        gama_i1: 16.0
                    duration_time_i: 1.0
                                                        demand_i: 60.0
                                                                                      work load_i: 60.0
                                                                                                                       work load gap_i: 0
                                                                                                   tail of i: 6.0
120
          V_id: 7
                              li: 5.0
                                                   xi: 3.5
                                                                       bow of i: 1.0
                                                                                                                            gama_i0: 16.0
                                                                                                                                                        gama_i1: 19.0
                                                                                                                       work load gap_i: 0
                                                        demand i: 160.0
                                                                                      work load i: 160.0
                    duration time i: 3.0
                                                                       bow of i: 73
                                                                                                                               gama_i0: 10.0
121
          V id: 8
                              li: 3.0
                                                   xi: 8.8
                                                                                                   tail of i: 10.3
                                                                                                                                                           gama i1: 12
     0
                    duration time i: 2.0
                                                        demand i: 120.0
                                                                                      work load i: 120.0
                                                                                                                       work load gap i: 0
122
          V_id: 9
                              li: 5.0
                                                                       bow of i: 1.2
                                                                                                   tail of i: 6.2
                                                                                                                            gama_i0: 27.0
                                                                                                                                                        gama_i1: 29.0
                                                        demand i: 80.0
                    duration_time_i: 2.0
                                                                                      work load i: 80.0
                                                                                                                       work load gap_i: 0
123
          V_id: 10
                                 li: 8.0
                                                     xi: 7.5
                                                                         bow of i: 3.5
                                                                                                     tail of i: 11.5
                                                                                                                                 gama_i0: 8.0
                                                                                                                                                             gama_i1:
     10.0
                         duration_time_i: 2.0
                                                            demand_i: 140.0
                                                                                           work load i: 140.0
                                                                                                                            work load gap_i: 0
                                                     xi: 3.2
124
          V id: 11
                                 li: 4.0
                                                                                                     tail of i: 5.2
                                                                                                                              gama i0: 29.0
                                                                                                                                                           gama i1: 31.
                                                                         bow of i: 1.2
                                                       demand_i: 100.0
     0
                    duration time i: 2.0
                                                                                      work load i: 100.0
                                                                                                                       work load gap_i: 0
125
                                                                         bow of i: 0.3
                                                                                                     tail of i: 4.3
          V_id: 12
                                 li: 4.0
                                                     xi: 2.3
                                                                                                                              gama_i0: 31.0
                                                                                                                                                           gama_i1: 35.
                                                        demand_i: 140.0
     0
                    duration_time_i: 4.0
                                                                                      work load_i: 140.0
                                                                                                                       work load gap_i: 0
          V_id: 13
                                                                                                                                   gama_i0: 4.0
126
                                                                            bow of i: 10.5
                                                                                                                                                               gama_i1
                                 li: 3.0
                                                                                                       tail of i: 13.5
                                                     xi: 12.0
                                                             demand_i: 80.0
     : 8.0
                         duration_time_i: 4.0
                                                                                           work load i: 80.0
                                                                                                                            work load gap_i: 0
                                                                                                                                 gama_i0: 1.0
127
          V id: 14
                                                     xi: 9.5
                                                                         bow of i: 8.0
                                                                                                     tail of i: 11.0
                                                                                                                                                             gama il: 4
                                 li: 3.0
     .0
                       duration time i: 3.0
                                                          demand i: 60.0
                                                                                         work load i: 60.0
                                                                                                                          work load gap i: 0
128
          V_id: 15
                                 li: 9.0
                                                                         bow of i: 0.1
                                                                                                                              gama_i0: 19.0
                                                     xi: 4.6
                                                                                                     tail of i: 9.1
                                                                                                                                                           gama i1: 22.
                                                        demand_i: 100.0
     0
                    duration_time_i: 3.0
                                                                                      work load i: 100.0
                                                                                                                       work load gap_i: 0
129
          V_id: 16
                                                                            bow of i: 8.0
                                                                                                        tail of i: 13.0
                                                                                                                                    gama_i0: 15.0
                                 li: 5.0
                                                     xi: 10.5
                                                                                                                                                               gama_i1
     : 18.0
                         duration time i: 3.0
                                                             demand i: 140.0
                                                                                           work load i: 140.0
                                                                                                                            work load gap i: 0
130
                                 li: 5.0
                                                     xi: 10.5
                                                                            bow of i: 8.0
                                                                                                        tail of i: 13.0
                                                                                                                                    gama_i0: 22.0
          V_id: 17
                                                                                                                                                               gama_i1
     : 24.0
                         duration time i: 2.0
                                                             demand i: 80.0
                                                                                           work load i: 80.0
                                                                                                                            work load gap_i: 0
131
    Algorithm finished and the total CPU time: 1241 s
132
133 End
134
```