```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=57883
 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_19_1 _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 = 57
       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 = 0.100000000000000000
31
32
33
   Iteration begin:
34
35
   Beging the No. 0 iteration:
     obj[0] = 77.20 temp_best_value_gen = 77.20
36
     The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
40
     obj[gen-1] = 77.20 temp_best_value_gen = 77.20
     No, maintain solution and obj[gen] = \overline{77.20}, and the tolerance counter = 1
41
42
     solution chromosome =
43
       first level: [ [ 3. 10. 18.5 25.5 27.5 2. 3. 4. 4. 3. 4. 2.5 3. 3.5
    2. 2.5 3.5 4.5 3.5]
44
45
       second level: [ 3. 3. 7. 5. 2. 4. 0. 1. 6. 8. 10. 12. 14. 16. 19. 21. 25. 2.
46
    28.]
47
       third level: [6. 2. 6. 2. 2. 3. 6. 5. 4. 2. 2. 2. 2. 3. 3. 2. 3. 9. 3.]]
48
     The No. 1 iteration is finished!
49
50
   Beging the No. 2 iteration:
51
     obj[gen-1] = 77.20 temp best value gen = 77.20
     No, maintain solution and obj[gen] = 77.20, and the tolerance_counter = 2
52
53
     solution chromosome =
54
       first level: [ [ 3. 10. 18.5 25.5 27.5 2. 3. 4. 4. 3. 4. 2.5 3. 3.5
55
    2. 2.5 3.5 4.5 3.5]
56
       second level: [ 3. 3. 7. 5. 2. 4. 0. 1. 6. 8. 10. 12. 14. 16. 19. 21. 25. 2.
57
    28.]
58
       third level: [6. 2. 6. 2. 2. 3. 6. 5. 4. 2. 2. 2. 2. 3. 3. 2. 3. 9. 3.]]
59
     The No. 2 iteration is finished!
60
   Beging the No. 3 iteration:
61
     obj[gen-1] = 77.20 temp_best_value_gen = 77.20
62
63
     No, maintain solution and obj[gen] = 77.20, and the tolerance_counter = 3
64
     solution chromosome =
65
       first level: [ [ 3. 10. 18.5 25.5 27.5 2. 3. 4. 4. 3. 4. 2.5 3. 3.5
    2. 2.5 3.5 4.5 3.5]
66
67
       second level: [ 3. 3. 7. 5. 2. 4. 0. 1. 6. 8. 10. 12. 14. 16. 19. 21. 25. 2.
68
    28.]
69
       third level: [6. 2. 6. 2. 2. 3. 6. 5. 4. 2. 2. 2. 2. 3. 3. 2. 3. 9. 3.]]
70
     The No. 3 iteration is finished!
71
   Beging the No. 4 iteration:
73
     obj[gen-1] = 77.20 temp_best_value_gen = 77.20
74
     No, maintain solution and obj[gen] = 77.20, and the tolerance_counter = 4
75
     solution chromosome =
76
       first level: [ ] 3. 10. 18.5 25.5 27.5 2. 3. 4. 4. 3. 4. 2.5 3. 3.5
    2. 2.5 3.5 4.5 3.5]
77
78
       second level: [ 3. 3. 7. 5. 2. 4. 0. 1. 6. 8. 10. 12. 14. 16. 19. 21. 25. 2.
79
    28.]
```

```
80
          third level: [6. 2. 6. 2. 2. 3. 6. 5. 4. 2. 2. 2. 2. 3. 3. 2. 3. 9. 3.]]
 81
       The No. 4 iteration is finished!
 82
 83
     Beging the No. 5 iteration:
       obj[gen-1] = 77.20 temp best value gen = 77.20
 84
 85
       No, maintain solution and obj[gen] = 77.20, and the tolerance_counter = 5
 86
       solution chromosome =
 87
          first level: [ [ 3. 10. 18.5 25.5 27.5 2. 3. 4. 4. 3. 4. 2.5 3. 3.5
 88
          2.5 3.5 4.5 3.5]
 89
          second level: [ 3. 3. 7. 5. 2. 4. 0. 1. 6. 8. 10. 12. 14. 16. 19. 21. 25. 2.
      28.]
 90
 91
          third level: [6. 2. 6. 2. 2. 3. 6. 5. 4. 2. 2. 2. 2. 3. 3. 2. 3. 9. 3.]]
 92
       The No. 5 iteration is finished!
 93
 94
     Beging the No. 6 iteration:
 95
       obj[gen-1] = 77.20 temp_best_value_gen = 77.20
       No, maintain solution and obj[\overline{gen}] = \overline{77.20}, and the tolerance_counter = 6
 96
 97
        solution chromosome =
 98
          first level: [ [ 3. 10. 18.5 25.5 27.5 2. 3. 4. 4. 3. 4. 2.5 3. 3.5
 99
          2.5 3.5 4.5 3.5]
100
          second level: [ 3. 3. 7. 5. 2. 4. 0. 1. 6. 8. 10. 12. 14. 16. 19. 21. 25. 2.
101
      28.]
102
          third level: [6. 2. 6. 2. 2. 3. 6. 5. 4. 2. 2. 2. 2. 3. 3. 2. 3. 9. 3.]]
103
        The No. 6 iteration is finished!
104
105
106
107
    The iteration is terminated and then visulize the solution:
108
        solution chromosome =
          first level: [ [ 3. 10. 18.5 25.5 27.5 2. 3. 4. 4. 3. 4. 2.5 3. 3.5
109
110
          2.5 3.5 4.5 3.5]
      2.
          second level: [ 3. 3. 7. 5. 2. 4. 0. 1. 6. 8. 10. 12. 14. 16. 19. 21. 25. 2.
111
112
     28.]
113
          third level: [6. 2. 6. 2. 2. 3. 6. 5. 4. 2. 2. 2. 2. 3. 3. 2. 3. 9. 3.]]
114
       Objective function values and some other indicators:
                                                          Obj0 + Obj1 = 232.00
115
          Obi0 = 30.00
                                 Obj1 = 202.00
116
          Total movement of crane: 16.00
117
          Total waiting time in berth position: 186.00
118
          Total index of q during berthing: 445.00
119
        Specific arrangement for each vessel:
120
                                                                                                                             gama_i0: 3.0
           V_id: 0
                              li: 6.0
                                                                       bow of i: 0.0
                                                                                                   tail of i: 6.0
                                                                                                                                                         gama_i1: 4.0
                                                        demand_i: 60.0
                    duration time i: 1.0
                                                                                       work load i: 60.0
                                                                                                                        work load gap i: 0
          V id: 1
121
                                                                          bow of i: 6.0
                              1i: 8.0
                                                   xi: 10.0
                                                                                                      tail of i: 14.0
                                                                                                                                  gama i0: 3.0
                                                                                                                                                              gama_i1: 5
     .0
                       duration_time_i: 2.0
                                                           demand i: 60.0
                                                                                         work load i: 60.0
                                                                                                                           work load gap_i: 0
122
           V_id: 2
                              li: 9.0
                                                   xi: 18.5
                                                                          bow of i: 14.0
                                                                                                      tail of i: 23.0
                                                                                                                                  gama_i0: 7.0
                                                                                                                                                              gama_i1: 9
     .0
                       duration time i: 2.0
                                                           demand_i: 160.0
                                                                                         work load_i: 160.0
                                                                                                                          work load gap_i: 0
123
           V_id: 3
                              li: 5.0
                                                   xi: 25.5
                                                                          bow of i: 23.0
                                                                                                      tail of i: 28.0
                                                                                                                                  gama_i0: 5.0
                                                                                                                                                              gama_i1: 8
                                                                                                                           work load gap_i: 0
     .0
                       duration_time_i: 3.0
                                                           demand_i: 100.0
                                                                                         work load_i: 100.0
                                                   xi: 27.5
124
           V_id: 4
                              li: 5.0
                                                                          bow of i: 25.0
                                                                                                      tail of i: 30.0
                                                                                                                                  gama i0: 2.0
                                                                                                                                                              gama i1:5
     .0
                       duration_time_i: 3.0
                                                           demand i: 120.0
                                                                                         work load i: 120.0
                                                                                                                          work load gap i: 0
125
           V id: 5
                              li: 4.0
                                                   xi: 2.0
                                                                       bow of i: 0.0
                                                                                                   tail of i: 4.0
                                                                                                                             gama i0: 4.0
                                                                                                                                                         gama i1: 6.0
                                                        demand_i: 100.0
                    duration_time_i: 2.0
                                                                                       work load_i: 100.0
                                                                                                                        work load gap_i: 0
126
           V id: 6
                              li: 6.0
                                                   xi: 3.0
                                                                       bow of i: 0.0
                                                                                                   tail of i: 6.0
                                                                                                                             gama i0: 0.0
                                                                                                                                                         gama_i1: 1.0
                                                        demand_i: 60.0
                     duration_time_i: 1.0
                                                                                       work load i: 60.0
                                                                                                                        work load gap_i: 0
127
          V_id: 7
                                                                       bow of i: 0.0
                                                                                                   tail of i: 8.0
                                                                                                                             gama_i0: 1.0
                              li: 8.0
                                                   xi: 4.0
                                                                                                                                                         gama_i1: 2.0
                     duration time i: 1.0
                                                        demand i: 80.0
                                                                                       work load i: 80.0
                                                                                                                        work load gap i: 0
128
          V id: 8
                                                   xi: 4.0
                                                                       bow of i: 0.0
                                                                                                   tail of i: 8.0
                                                                                                                             gama i0: 6.0
                              li: 8.0
                                                                                                                                                         gama i1: 8.0
                     duration_time_i: 2.0
                                                        demand_i: 140.0
                                                                                       work load_i: 140.0
                                                                                                                        work load gap_i: 0
129
           V_id: 9
                              li: 6.0
                                                   xi: 3.0
                                                                       bow of i: 0.0
                                                                                                   tail of i: 6.0
                                                                                                                             gama_i0: 8.0
                                                                                                                                                         gama_i1: 10.0
                     duration_time_i: 2.0
                                                        demand_i: 60.0
                                                                                       work load_i: 60.0
                                                                                                                        work load gap_i: 0
          V_id: 10
                                                                          bow of i: 0.0
130
                                 li: 8.0
                                                      xi: 4.0
                                                                                                      tail of i: 8.0
                                                                                                                                gama_i0: 10.0
                                                                                                                                                            gama_i1: 12.
     0
                                                        demand i: 80.0
                                                                                       work load_i: 80.0
                                                                                                                        work load gap_i: 0
                    duration time i: 2.0
131
                                 li: 5.0
                                                     xi: 2.5
           V id: 11
                                                                          bow of i: 0.0
                                                                                                      tail of i: 5.0
                                                                                                                               gama i0: 12.0
                                                                                                                                                           gama i1: 14.
     0
                                                        demand_i: 60.0
                                                                                       work load_i: 60.0
                                                                                                                        work load gap_i: 0
                    duration time i: 2.0
132
           V_id: 12
                                 li: 6.0
                                                      xi: 3.0
                                                                          bow of i: 0.0
                                                                                                      tail of i: 6.0
                                                                                                                               gama_i0: 14.0
                                                                                                                                                            gama_i1: 16.
     0
                     duration_time_i: 2.0
                                                        demand_i: 60.0
                                                                                       work load_i: 60.0
                                                                                                                        work load gap_i: 0
133
           V id: 13
                                                                          bow of i: 0.0
                                                                                                      tail of i: 7.0
                                                      xi: 3.5
                                                                                                                               gama i0: 16.0
                                                                                                                                                           gama i1: 19.
                                 li: 7.0
     0
                    duration_time_i: 3.0
                                                        demand i: 140.0
                                                                                       work load i: 140.0
                                                                                                                        work load gap_i: 0
                                                     xi: 2.0
134
           V id: 14
                                 li: 4.0
                                                                          bow of i: 0.0
                                                                                                      tail of i: 4.0
                                                                                                                               gama i0: 19.0
                                                                                                                                                            gama i1: 21.
     0
                                                        demand_i: 100.0
                    duration_time_i: 2.0
                                                                                       work load_i: 100.0
                                                                                                                        work load gap_i: 0
135
          V_id: 15
                                                                         bow of i: 0.0
                                                                                                                               gama_i0: 21.0
                                                      xi: 2.5
                                                                                                      tail of i: 5.0
                                                                                                                                                            gama i1: 25.
                                 li: 5.0
     0
                     duration_time_i: 4.0
                                                        demand_i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                        work load gap_i: 0
136
           V id: 16
                                 li: 7.0
                                                      xi: 3.5
                                                                          bow of i: 0.0
                                                                                                      tail of i: 7.0
                                                                                                                               gama_i0: 25.0
                                                                                                                                                            gama_i1: 28.
     0
                                                        demand i: 160.0
                                                                                       work load i: 160.0
                                                                                                                        work load gap i: 0
                    duration_time_i: 3.0
137
           V_id: 17
                                                                          bow of i: 0.0
                                                                                                      tail of i: 90
                                 1i: 9 0
                                                                                                                               gama_i0: 2.0
                                                                                                                                                            gama_i1: 3.0
                                                      xi: 4.5
                     duration time i: 1.0
                                                        demand i: 60.0
                                                                                       work load i: 60.0
                                                                                                                        work load gap i: 0
138
           V_id: 18
                                 li: 7.0
                                                      xi: 3.5
                                                                          bow of i: 0.0
                                                                                                      tail of i: 7.0
                                                                                                                               gama_i0: 28.0
                                                                                                                                                            gama_i1: 31.
                                                                                                                        work load gap_i: 0
     0
                    duration_time_i: 3.0
                                                        demand i: 160.0
                                                                                       work load i: 160.0
139
140
    Algorithm finished and the total CPU time: 1331 s
141 End
142
```