```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=35712
 2
 3
   import sys; print('Python %s on %s' % (sys.version, sys.platform))
   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_16_9 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 = 48
        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] = 53.70 temp_best_value_gen = 53.70
36
      The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
      obj[gen-1] = 53.70 temp_best_value_gen = 53.70
40
      No, maintain solution and obj[gen] = 53.70, and the tolerance_counter = 1
41
42
      solution chromosome =
43
        first level: [[3. 9. 16.5 25.5 25.5 4.5 3.5 2. 2.5 2.5 1.5 1.5 2.5 2.5
44
    2. 3.5]
        second level: [4, 6, 5, 1, 2, 2, 9, 5, 7, 11, 13, 15, 1, 3, 18, 20,] third level: [4, 2, 3, 7, 2, 7, 7, 2, 3, 5, 3, 1, 4, 4, 4, 7,]]
45
46
47
     The No. 1 iteration is finished!
48
49
   Beging the No. 2 iteration:
50
      obj[gen-1] = 53.70 temp_best_value_gen = 53.70
51
      No, maintain solution and obj[gen] = 53.70, and the tolerance_counter = 2
52
      solution chromosome =
53
        first level: [[3. 9. 16.5 25.5 25.5 4.5 3.5 2. 2.5 2.5 1.5 1.5 2.5 2.5
54
55
        second level: [4, 6, 5, 1, 2, 2, 9, 5, 7, 11, 13, 15, 1, 3, 18, 20,]
56
        third level: [4. 2. 3. 7. 2. 7. 7. 2. 3. 5. 3. 1. 4. 4. 4. 7.]]
57
      The No. 2 iteration is finished!
58
59
   Beging the No. 3 iteration:
      obj[gen-1] = 53.70 temp_best_value_gen = 53.70
60
      No, maintain solution and obj[gen] = 53.70, and the tolerance_counter = 3
61
62
      solution chromosome =
63
        first level: [ ] 3. 9. 16.5 25.5 25.5 4.5 3.5 2. 2.5 2.5 1.5 1.5 2.5 2.5
64
65
        second level: [4. 6. 5. 1. 2. 2. 9. 5. 7. 11. 13. 15. 1. 3. 18. 20.]
        third level: [4. 2. 3. 7. 2. 7. 7. 2. 3. 5. 3. 1. 4. 4. 4. 7.]]
66
67
      The No. 3 iteration is finished!
68
69 Beging the No. 4 iteration:
      obj[gen-1] = 53.70 temp_best_value_gen = 53.70
70
71
      No, maintain solution and obj[gen] = 53.70, and the tolerance_counter = 4
      solution chromosome =
73
        first level: [ [ 3. 9. 16.5 25.5 25.5 4.5 3.5 2. 2.5 2.5 1.5 1.5 2.5 2.5
74
        second level: [4, 6, 5, 1, 2, 2, 9, 5, 7, 11, 13, 15, 1, 3, 18, 20,] third level: [4, 2, 3, 7, 2, 7, 7, 2, 3, 5, 3, 1, 4, 4, 4, 7,]]
75
76
     The No. 4 iteration is finished!
77
78
   Beging the No. 5 iteration:
79
```

```
obj[gen-1] = 53.70 temp_best_value_gen = 53.70
 80
        No, maintain solution and obj[gen] = \overline{53.70}, and the tolerance_counter = 5
 81
 82
        solution chromosome =
 83
          first level: [ ] 3. 9. 16.5 25.5 25.5 4.5 3.5 2. 2.5 2.5 1.5 1.5 2.5 2.5
 84
          3.51
          second level: [4, 6, 5, 1, 2, 2, 9, 5, 7, 11, 13, 15, 1, 3, 18, 20,] third level: [4, 2, 3, 7, 2, 7, 7, 2, 3, 5, 3, 1, 4, 4, 4, 7,]]
 85
 86
 87
        The No. 5 iteration is finished!
 88
 89
     Beging the No. 6 iteration:
 90
        obj[gen-1] = 53.70 temp_best_value_gen = 53.70
 91
        No, maintain solution and obj[gen] = 53.70, and the tolerance_counter = 6
 92
        solution chromosome =
 93
          first level: [[3. 9. 16.5 25.5 25.5 4.5 3.5 2. 2.5 2.5 1.5 1.5 2.5 2.5
 94
          3.5]
 95
          second level: [4. 6. 5. 1. 2. 2. 9. 5. 7. 11. 13. 15. 1. 3. 18. 20.]
          third level: [4. 2. 3. 7. 2. 7. 7. 2. 3. 5. 3. 1. 4. 4. 4. 7.]]
 96
 97
        The No. 6 iteration is finished!
 98
 99
     Beging the No. 7 iteration:
100
        obj[gen-1] = 53.70 temp_best_value_gen = 53.70
101
        No, maintain solution and obj[gen] = 53.70, and the tolerance_counter = 7
102
        solution chromosome =
          first level: [ [ 3. 9. 16.5 25.5 25.5 4.5 3.5 2. 2.5 2.5 1.5 1.5 2.5 2.5
103
104
          3.51
105
          second level: [4. 6. 5. 1. 2. 2. 9. 5. 7. 11. 13. 15. 1. 3. 18. 20.]
          third level: [4. 2. 3. 7. 2. 7. 7. 2. 3. 5. 3. 1. 4. 4. 4. 7.]]
106
        The No. 7 iteration is finished!
107
108
109
110
111 The iteration is terminated and then visulize the solution:
112
        solution chromosome =
          first level: [ [ 3. 9. 16.5 25.5 25.5 4.5 3.5 2. 2.5 2.5 1.5 1.5 2.5 2.5
113
114
          second level: [4. 6. 5. 1. 2. 2. 9. 5. 7. 11. 13. 15. 1. 3. 18. 20.] third level: [4. 2. 3. 7. 2. 7. 7. 2. 3. 5. 3. 1. 4. 4. 4. 7.]]
115
116
117
        Objective function values and some other indicators:
                                 Obj1 = 138.00
118
          Obi0 = 21.00
                                                           Obj0 + Obj1 = 159.00
119
          Total movement of crane: 16.00
120
          Total waiting time in berth position: 122.00
121
          Total index of q during berthing: 422.00
122
        Specific arrangement for each vessel:
123
           V_id: 0
                               li: 6.0
                                                    xi: 3.0
                                                                         bow of i: 0.0
                                                                                                     tail of i: 6.0
                                                                                                                               gama_i0: 4.0
                                                                                                                                                            gama i1: 5.0
                     duration_time_i: 1.0
                                                         demand_i: 80.0
                                                                                        work load_i: 80.0
                                                                                                                          work load gap_i: 0
124
           V_id: 1
                               li: 6.0
                                                    xi: 9.0
                                                                         bow of i: 6.0
                                                                                                     tail of i: 12.0
                                                                                                                                  gama_i0: 6.0
                                                                                                                                                              gama_i1: 9.0
                     duration_time_i: 3.0
                                                         demand_i: 120.0
                                                                                        work load_i: 120.0
                                                                                                                          work load gap_i: 0
                                                                                                        tail of i: 21.0
                                                                                                                                    gama_i0: 5.0
125
           V id: 2
                               li: 9.0
                                                    xi: 16.5
                                                                           bow of i: 12.0
                                                                                                                                                                 gama_i1: 8
                       duration time i: 3.0
                                                                                                                            work load gap i: 0
     .0
                                                            demand i: 160.0
                                                                                           work load i: 160.0
126
                               li: 9.0
           V_id: 3
                                                    xi: 25.5
                                                                           bow of i: 21.0
                                                                                                       tail of i: 30.0
                                                                                                                                    gama_i0: 1.0
                                                                                                                                                                 gama_i1: 2
     .0
                        duration time i: 1.0
                                                            demand i: 80.0
                                                                                           work load i: 80.0
                                                                                                                             work load gap i: 0
127
                               li: 9.0
           V_id: 4
                                                                           bow of i: 21.0
                                                                                                       tail of i: 30.0
                                                                                                                                    gama_i0: 2.0
                                                                                                                                                                 gama_i1: 5
                       duration_time_i: 3.0
                                                            demand_i: 100.0
                                                                                           work load i: 100.0
                                                                                                                            work load gap_i: 0
     .0
                                                    xi: 4.5
128
           V_id: 5
                               li: 9.0
                                                                        bow of i: 0.0
                                                                                                     tail of i: 9.0
                                                                                                                               gama_i0: 2.0
                                                                                                                                                            gama_i1: 3.0
                                                         demand_i: 60.0
                                                                                        work load i: 60.0
                                                                                                                          work load gap_i: 0
                     duration_time_i: 1.0
129
           V id: 6
                                                    xi: 3.5
                                                                        bow of i: 0.0
                                                                                                     tail of i: 7.0
                                                                                                                               gama i0: 9.0
                               1i: 7.0
                                                                                                                                                            gama i1: 11.0
                     duration_time_i: 2.0
                                                         demand\_i{:}\ 160.0
                                                                                        work load i: 160.0
                                                                                                                          work load gap i: 0
                                                                        bow of i: 0.0
130
          V_id: 7
                               li: 4.0
                                                    xi: 2.0
                                                                                                     tail of i: 4.0
                                                                                                                               gama_i0: 5.0
                                                                                                                                                            gama_i1: 7.0
                                                         demand_i: 80.0
                     duration_time_i: 2.0
                                                                                        work load_i: 80.0
                                                                                                                          work load gap_i: 0
131
          V_id: 8
                                                                                                                                                            gama_i1: 9.0
                               li: 5.0
                                                    xi: 2.5
                                                                        bow of i: 0.0
                                                                                                     tail of i: 5.0
                                                                                                                               gama i0: 7.0
                                                         demand_i: 80.0
                     duration_time_i: 2.0
                                                                                        work load i: 80.0
                                                                                                                          work load gap_i: 0
                                                                                                                                                            gama_i1: 13.0
132
           V id: 9
                                                    xi: 2.5
                                                                         bow of i: 0.0
                                                                                                     tail of i: 5.0
                                                                                                                               gama_i0: 11.0
                               li: 5.0
                                                         demand i: 120.0
                     duration time i: 2.0
                                                                                        work load i: 120.0
                                                                                                                          work load gap i: 0
133
           V_id: 10
                                                                           bow of i: 0.0
                                                                                                                                 gama_i0: 13.0
                                 li: 3.0
                                                                                                       tail of i: 3.0
                                                                                                                                                              gama_i1: 15.
                                                       xi: 1.5
     0
                     duration_time_i: 2.0
                                                         demand_i: 120.0
                                                                                        work load_i: 120.0
                                                                                                                          work load gap_i: 0
134
                                                                           bow of i: 0.0
                                                                                                                                 gama_i0: 15.0
                                 li: 3.0
                                                       xi: 1.5
                                                                                                        tail of i: 3.0
                                                                                                                                                               gama_i1: 18.
     0
                                                         demand i: 60.0
                                                                                                                          work load gap i: 0
                    duration time i: 3.0
                                                                                        work load i: 60.0
135
          V_id: 12
                                                                                                                                  gama_i0: 1.0
                                 li: 5.0
                                                       xi: 2.5
                                                                           bow of i: 0.0
                                                                                                       tail of i: 5.0
                                                                                                                                                               gama_i1: 2.0
                     duration_time_i: 1.0
                                                         demand i: 80.0
                                                                                        work load_i: 80.0
                                                                                                                          work load gap i: 0
           V_id: 13
136
                                                                           bow of i: 0.0
                                 li: 5.0
                                                       xi: 2.5
                                                                                                       tail of i: 5.0
                                                                                                                                 gama_i0: 3.0
                                                                                                                                                               gama_i1: 4.0
                     duration_time_i: 1.0
                                                         demand_i: 80.0
                                                                                        work load_i: 80.0
                                                                                                                          work load gap_i: 0
137
           V_id: 14
                                 li: 4.0
                                                       xi: 2.0
                                                                           bow of i: 0.0
                                                                                                        tail of i: 4.0
                                                                                                                                  gama_i0: 18.0
                                                                                                                                                               gama_i1: 20.
     0
                                                                                                                          work load gap_i: 0
                     duration_time_i: 2.0
                                                         demand_i: 120.0
                                                                                        work load_i: 120.0
                                                      xi: 3.5
138
           V id: 15
                                 li: 7.0
                                                                           bow of i: 0.0
                                                                                                        tail of i: 7.0
                                                                                                                                 gama i0: 20.0
                                                                                                                                                              gama i1: 22.
     0
                     duration_time_i: 2.0
                                                         demand i: 160.0
                                                                                        work load_i: 160.0
                                                                                                                          work load gap_i: 0
139
140 Algorithm finished and the total CPU time: 1314 s
141 End
142
```