```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=40959
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'])
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_13_2 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 = 39
       Iter_num_GA = 300
24
25
       Select_rate = 0.85
26
       Crossover rate = 0.95
27
       Mutation rate = 0.95
28
       Mu_oper_type = 1
29
       vessel\_move\_way = 2
30
       coefficient for Obj1= 1.9
       coefficient for Obj2= 0.100000000000000009
31
32
33
34
   Iteration begin:
35
   Beging the No. 0 iteration:
     obj[0] = 62.80 temp_best_value_gen = 62.80
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 62.80 temp_best_value_gen = 62.80
40
     No, maintain solution and obj[gen] = 62.80, and the tolerance_counter = 1
41
42
     solution chromosome =
43
       first level: [[ 3. 10.5 17. 21.5 25.5 27. 3.5 3.5 1.5 4. 2.5 3. 3. ]
       second level: [ 2. 2. 0. 7. 10. 13. 17. 1. 8. 12. 14. 5. 20.]
44
       third level: [2. 9. 4. 2. 2. 2. 3. 5. 2. 4. 3. 2. 2.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 62.80 temp_best_value_gen = 57.60
49
50
     Yes, update solution and obj[gen] = 57.60
51
     solution chromosome =
52
       first level: [ [ 3. 10.5 17. 21.5 25.5 27. 3.5 3.5 1.5 4. 3.5 3. 3. ]
53
       second level: [ 2. 2. 0. 7. 10. 13. 14. 1. 18. 12. 5. 6. 9.]
54
       third level: [2. 9. 4. 2. 2. 2. 3. 7. 2. 4. 5. 2. 2.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 57.60 temp best value gen = 57.60
59
     No, maintain solution and obj[gen] = 57.60, and the tolerance_counter = 1
60
     solution chromosome =
       first level: [[ 3. 10.5 17. 21.5 25.5 27. 3.5 3.5 1.5 4. 3.5 3. 3. ]
61
       second level: [ 2. 2. 0. 7. 10. 13. 14. 1. 18. 12. 5. 6. 9.]
62
       third level: [2. 9. 4. 2. 2. 2. 3. 7. 2. 4. 5. 2. 2.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 57.60 temp_best_value_gen = 57.60
68
     No, maintain solution and obj[gen] = 57.60, and the tolerance_counter = 2
69
     solution chromosome =
       first level: [ [ 3, 10.5 17, 21.5 25.5 27, 3.5 3.5 1.5 4, 3.5 3, 3, ] second level: [ 2, 2, 0, 7, 10, 13, 14, 1, 18, 12, 5, 6, 9,]
70
71
       third level: [2. 9. 4. 2. 2. 2. 3. 7. 2. 4. 5. 2. 2.]]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 57.60 temp best value gen = 57.60
76
     No, maintain solution and obj[gen] = 57.60, and the tolerance_counter = 3
77
78
     solution chromosome =
        first level: [ [ 3. 10.5 17. 21.5 25.5 27. 3.5 3.5 1.5 4. 3.5 3. 3. ]
```

```
80
           second level: [2, 2, 0, 7, 10, 13, 14, 1, 18, 12, 5, 6, 9,]
 81
          third level: [2. 9. 4. 2. 2. 2. 3. 7. 2. 4. 5. 2. 2.]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 84
 85
        obj[gen-1] = 57.60 temp best value gen = 57.60
        No, maintain solution and obj[gen] = 57.60, and the tolerance_counter = 4
 86
 87
        solution chromosome =
          first level: [ [ 3. 10.5 17. 21.5 25.5 27. 3.5 3.5 1.5 4. 3.5 3. 3. ]
 88
 89
          second level: [ 2. 2. 0. 7. 10. 13. 14. 1. 18. 12. 5. 6. 9.]
 90
          third level: [2. 9. 4. 2. 2. 2. 3. 7. 2. 4. 5. 2. 2.]]
 91
        The No. 6 iteration is finished!
 92
 93
     Beging the No. 7 iteration:
 94
        obj[gen-1] = 57.60 temp_best_value_gen = 57.60
 95
        No, maintain solution and obj[gen] = 57.60, and the tolerance_counter = 5
 96
        solution chromosome =
 97
          first level: [[3. 10.5 17. 21.5 25.5 27. 3.5 3.5 1.5 4. 3.5 3. 3.]
 98
          second level: [ 2. 2. 0. 7. 10. 13. 14. 1. 18. 12. 5. 6. 9.]
 99
          third level: [2. 9. 4. 2. 2. 2. 3. 7. 2. 4. 5. 2. 2.]]
100
        The No. 7 iteration is finished!
101
     Beging the No. 8 iteration:
102
103
        obi[gen-1] = 57.60 temp best value gen = 57.60
        No, maintain solution and obj[gen] = 57.60, and the tolerance_counter = 6
104
105
        solution chromosome =
          first level: [ [ 3. 10.5 17. 21.5 25.5 27. 3.5 3.5 1.5 4. 3.5 3. 3. ]
106
107
          second level: [ 2. 2. 0. 7. 10. 13. 14. 1. 18. 12. 5. 6. 9.]
          third level: [2. 9. 4. 2. 2. 2. 3. 7. 2. 4. 5. 2. 2.]]
108
109
        The No. 8 iteration is finished!
110
111
112
113
     The iteration is terminated and then visulize the solution:
114
        solution chromosome =
          first level: [[3. 10.5 17. 21.5 25.5 27. 3.5 3.5 1.5 4. 3.5 3. 3.]
115
116
           second level: [2. 2. 0. 7. 10. 13. 14. 1. 18. 12. 5. 6. 9.]
          third level: [2. 9. 4. 2. 2. 2. 3. 7. 2. 4. 5. 2. 2.]]
117
118
        Objective function values and some other indicators:
                                                          Obj0 + Obj1 = 198.00
119
          Obi0 = 21.00
                                 Obj1 = 177.00
120
          Total movement of crane: 34.00
121
          Total waiting time in berth position: 99.00
122
          Total index of q during berthing: 488.00
123
        Specific arrangement for each vessel:
124
           V_id: 0
                              li: 6.0
                                                   xi: 3.0
                                                                       bow of i: 0.0
                                                                                                   tail of i: 6.0
                                                                                                                            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: 1
                                                                         bow of i: 6.0
                              li: 9.0
                                                   xi: 10.5
                                                                                                     tail of i: 15.0
                                                                                                                                 gama_i0: 2.0
                                                                                                                                                             gama_i1: 3
     .0
                       duration_time_i: 1.0
                                                          demand i: 60.0
                                                                                         work load i: 60.0
                                                                                                                         work load gap_i: 0
126
           V id: 2
                              li: 4.0
                                                   xi: 17.0
                                                                         bow of i: 15.0
                                                                                                     tail of i: 19.0
                                                                                                                                 gama i0: 0.0
                                                                                                                                                             gama il: 1
      .0
                       duration_time_i: 1.0
                                                          demand i: 80.0
                                                                                         work load_i: 80.0
                                                                                                                         work load gap_i: 0
127
           V id: 3
                               li: 5.0
                                                   xi: 21.5
                                                                         bow of i: 19.0
                                                                                                     tail of i: 24.0
                                                                                                                                 gama i0: 7.0
                                                                                                                                                             gama i1:
                                                                                                                            work load gap_i: 0
     10.0
                         duration_time_i: 3.0
                                                            demand_i: 100.0
                                                                                           work load_i: 100.0
128
          V_id: 4
                                                                                                                                 gama_i0: 10.0
                              li: 3.0
                                                   xi: 25.5
                                                                         bow of i: 24.0
                                                                                                     tail of i: 27.0
                                                                                                                                                             gama i1:
     13.0
                         duration_time_i: 3.0
                                                             demand i: 100.0
                                                                                           work load_i: 100.0
                                                                                                                            work load gap_i: 0
129
           V_id: 5
                                                   xi: 27.0
                                                                         bow of i: 24.0
                                                                                                     tail of i: 30.0
                                                                                                                                 gama_i0: 13.0
                               li: 6.0
                                                                                                                                                             gama_i1:
                                                                                                                            work load gap i: 0
     17.0
                         duration time i: 4.0
                                                            demand i: 140.0
                                                                                           work load i: 140.0
130
                                                                                                                            gama i0: 14.0
          V_id: 6
                              1i: 7.0
                                                   xi: 3.5
                                                                       bow of i: 0.0
                                                                                                   tail of i: 7.0
                                                                                                                                                        gama i1: 17.0
                     duration_time_i: 3.0
                                                        demand_i: 160.0
                                                                                      work load_i: 160.0
                                                                                                                       work load gap_i: 0
131
           V_id: 7
                              li: 7.0
                                                   xi: 3.5
                                                                       bow of i: 0.0
                                                                                                   tail of i: 7.0
                                                                                                                            gama_i0: 1.0
                                                                                                                                                        gama_i1: 2.0
                                                        demand i: 60.0
                                                                                                                       work load gap_i: 0
                     duration time i: 1.0
                                                                                      work load i: 60.0
                                                                                                                            gama_i0: 18.0
132
           V id: 8
                              li: 3.0
                                                   xi: 1.5
                                                                       bow of i: 0.0
                                                                                                   tail of i: 3.0
                                                                                                                                                        gama_i1: 22.0
                     duration time i: 4.0
                                                        demand i: 160.0
                                                                                      work load i: 160.0
                                                                                                                       work load gap i: 0
133
          V id: 9
                              li: 8.0
                                                   xi: 4.0
                                                                       bow of i: 0.0
                                                                                                   tail of i: 8.0
                                                                                                                            gama i0: 12.0
                                                                                                                                                        gama i1: 14.0
                                                       demand_i: 140.0
                                                                                      work load_i: 140.0
                                                                                                                       work load gap_i: 0
                    duration_time_i: 2.0
134
          V_id: 10
                                 li: 5.0
                                                      xi: 3.5
                                                                         bow of i: 1.0
                                                                                                     tail of i: 6.0
                                                                                                                              gama_i0: 5.0
                                                                                                                                                          gama_i1: 6.0
                                                        demand_i: 80.0
                                                                                      work load_i: 80.0
                                                                                                                       work load gap_i: 0
                     duration_time_i: 1.0
135
           V id: 11
                                                                         bow of i: 0.0
                                                                                                     tail of i: 6.0
                                                                                                                              gama i0: 6.0
                                                                                                                                                          gama i1: 9.0
                                 li: 6.0
                                                     xi: 3.0
                                                       demand i: 120.0
                                                                                                                       work load gap i: 0
                     duration_time_i: 3.0
                                                                                      work load i: 120.0
                                                                         bow of i: 1.5
136
           V id: 12
                                 li: 3.0
                                                     xi: 3.0
                                                                                                     tail of i: 4.5
                                                                                                                              gama i0: 9.0
                                                                                                                                                          gama i1: 11.
     0
                    duration_time_i: 2.0
                                                        demand_i: 80.0
                                                                                      work load_i: 80.0
                                                                                                                       work load gap_i: 0
137
     Algorithm finished and the total CPU time: 1247 s
138
139
     End
140
```