```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=5737
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'])
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_14_8 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 = 42
       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] = 72.53 temp_best_value_gen = 72.53
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 72.53 temp_best_value_gen = 72.53
40
     No, maintain solution and obj[gen] = 72.53, and the tolerance_counter = 1
41
42
     solution chromosome =
       first level: [ [3.72 5.11 6.1 5.41 5.48 3.69 8.98 2.47 2.33 2.1 4.98 3.2 8.35 3.21]
43
44
       second level: [4. 0. 1. 6. 7. 8. 10. 10. 14. 15. 18. 17. 15. 19.]
       third level: [6. 6. 3. 7. 8. 3. 3. 2. 3. 3. 6. 5. 6. 4.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
obj[gen-1] = 72.53 temp_best_value_gen = 72.53
49
50
     No, maintain solution and obj[gen] = 72.53, and the tolerance_counter = 2
51
     solution chromosome =
52
       first level: [ [3.72 5.11 6.1 5.41 5.48 3.69 8.98 2.47 2.33 2.1 4.98 3.2 8.35 3.21]
53
       second level: [4. 0. 1. 6. 7. 8. 10. 10. 14. 15. 18. 17. 15. 19.]
54
       third level: [6. 6. 3. 7. 8. 3. 3. 2. 3. 3. 6. 5. 6. 4.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 72.53 temp best value gen = 72.53
59
     No, maintain solution and obj[gen] = 72.53, and the tolerance_counter = 3
60
     solution chromosome =
       first level: [ [3.72 5.11 6.1 5.41 5.48 3.69 8.98 2.47 2.33 2.1 4.98 3.2 8.35 3.21]
61
62
       second level: [4. 0. 1. 6. 7. 8. 10. 10. 14. 15. 18. 17. 15. 19.]
       third level: [6. 6. 3. 7. 8. 3. 3. 2. 3. 3. 6. 5. 6. 4.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
     obj[gen-1] = 72.53 temp_best_value_gen = 72.53
67
68
     No, maintain solution and obj[gen] = 72.53, and the tolerance_counter = 4
69
     solution chromosome =
70
       first level: [ [3.72 5.11 6.1 5.41 5.48 3.69 8.98 2.47 2.33 2.1 4.98 3.2 8.35 3.21]
       second level: [ 4. 0. 1. 6. 7. 8. 10. 10. 14. 15. 18. 17. 15. 19.]
71
       third level: [6. 6. 3. 7. 8. 3. 3. 2. 3. 3. 6. 5. 6. 4.]]
73
     The No. 4 iteration is finished!
74
75
  Beging the No. 5 iteration:
     obi[gen-1] = 72.53 temp best value gen = 72.53
76
     No, maintain solution and obj[gen] = \overline{72.53}, and the tolerance_counter = 5
77
78
     solution chromosome =
        first level: [ [3.72 5.11 6.1 5.41 5.48 3.69 8.98 2.47 2.33 2.1 4.98 3.2 8.35 3.21]
```

```
second level: [4. 0. 1. 6. 7. 8. 10. 10. 14. 15. 18. 17. 15. 19.]
 80
 81
          third level: [6. 6. 3. 7. 8. 3. 3. 2. 3. 3. 6. 5. 6. 4.]]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
 84
 85
        obi[gen-1] = 72.53 temp best value gen = 68.77
        Yes, update solution and obj[gen] = 68.77
 86
 87
        solution chromosome =
          first level: [ [3.6 5.11 6.1 5.41 5.48 3.69 8.98 2.47 2.33 3.72 4.98 3.2 8.35 3.21]
 88
 89
          second level: [20. 0. 1. 6. 7. 10. 14. 14. 18. 4. 8. 9. 4. 13.]
 90
          third level: [2. 6. 3. 7. 8. 2. 6. 2. 2. 3. 6. 5. 6. 4.]]
 91
        The No. 6 iteration is finished!
 92
 93
     Beging the No. 7 iteration:
 94
        obj[gen-1] = 68.77 temp_best_value_gen = 68.77
 95
        No, maintain solution and obj[gen] = 68.77, and the tolerance_counter = 1
 96
        solution chromosome =
          first level: [ [3.6 5.11 6.1 5.41 5.48 3.69 8.98 2.47 2.33 3.72 4.98 3.2 8.35 3.21]
 97
 98
           second level: [20. 0. 1. 6. 7. 10. 14. 14. 18. 4. 8. 9. 4. 13.]
 99
          third level: [2. 6. 3. 7. 8. 2. 6. 2. 2. 3. 6. 5. 6. 4.]]
100
        The No. 7 iteration is finished!
101
     Beging the No. 8 iteration:
102
103
        obi[gen-1] = 68.77 temp best value gen = 68.77
        No, maintain solution and obj[gen] = 68.77, and the tolerance_counter = 2
104
105
        solution chromosome =
          first level: [ [3.6 5.11 6.1 5.41 5.48 3.69 8.98 2.47 2.33 3.72 4.98 3.2 8.35 3.21]
106
          second level: [20. 0. 1. 6. 7. 10. 14. 14. 18. 4. 8. 9. 4. 13.] third level: [2. 6. 3. 7. 8. 2. 6. 2. 2. 3. 6. 5. 6. 4.]]
107
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: [ [3.6 5.11 6.1 5.41 5.48 3.69 8.98 2.47 2.33 3.72 4.98 3.2 8.35 3.21]
115
116
           second level: [20. 0. 1. 6. 7. 10. 14. 14. 18. 4. 8. 9. 4. 13.]
          third level: [2, 6, 3, 7, 8, 2, 6, 2, 2, 3, 6, 5, 6, 4,]]
117
        Objective function values and some other indicators:
118
                                 Obj1 = 250.68
119
           Obi0 = 23.00
                                                           Obj0 + Obj1 = 273.68
120
          Total movement of crane: 32.68
121
           Total waiting time in berth position: 128.00
122
          Total index of q during berthing: 224.00
123
        Specific arrangement for each vessel:
124
           V_id: 0
                               li: 7.0
                                                   xi: 3.6
                                                                        bow of i: 0.1
                                                                                                    tail of i: 7.1
                                                                                                                              gama_i0: 20.0
                                                                                                                                                           gama_i1: 24.0
                     duration_time_i: 4.0
                                                                                                                         work load gap i: 0
                                                         demand i: 160.0
                                                                                        work load i: 160.0
                                                                                                                              gama_i0: 0.0
125
           V_id: 1
                               li: 6.0
                                                    xi: 5.1
                                                                        bow of i: 2.1
                                                                                                    tail of i: 8.1
                                                                                                                                                           gama_i1: 1.0
                     duration_time_i: 1.0
                                                         demand_i: 80.0
                                                                                        work load i: 80.0
                                                                                                                         work load gap_i: 0
126
           V_id: 2
                                                                                                    tail of i: 10.1
                                                                                                                                 gama i0: 1.0
                                                                                                                                                             gama i1: 4.0
                               1i: 8.0
                                                    xi: 6.1
                                                                        bow of i: 2.1
                                                                                                                         work load gap_i: 0
                     duration time i: 3.0
                                                         demand i: 140.0
                                                                                        work load i: 140.0
127
           V id: 3
                               li: 7.0
                                                    xi: 5.4
                                                                        bow of i: 1.9
                                                                                                    tail of i: 8.9
                                                                                                                              gama i0: 6.0
                                                                                                                                                           gama i1: 7.0
                                                                                                                         work load gap_i: 0
                     duration_time_i: 1.0
                                                         demand_i: 120.0
                                                                                        work load_i: 120.0
128
           V id: 4
                                                                        bow of i: 1.5
                               li: 8.0
                                                    xi: 5.5
                                                                                                    tail of i: 9.5
                                                                                                                              gama i0: 7.0
                                                                                                                                                           gama i1: 8.0
                     duration_time_i: 1.0
                                                         demand i: 160.0
                                                                                        work load i: 160.0
                                                                                                                         work load gap_i: 0
129
           V id: 5
                               li: 4.0
                                                    xi: 3.7
                                                                        bow of i: 1.7
                                                                                                    tail of i: 5.7
                                                                                                                              gama_i0: 10.0
                                                                                                                                                           gama_i1: 13.0
                     duration time i: 3.0
                                                         demand i: 100.0
                                                                                        work load i: 100.0
                                                                                                                         work load gap i: 0
           V_id: 6
                                                                                                                                 gama_i0: 14.0
130
                               li: 9.0
                                                    xi: 9.0
                                                                        bow of i: 4.5
                                                                                                    tail of i: 13.5
                                                                                                                                                             gama i1: 16.
     0
                     duration_time_i: 2.0
                                                         demand_i: 140.0
                                                                                        work load_i: 140.0
                                                                                                                         work load gap_i: 0
                                                                        bow of i: 1.0
131
           V_id: 7
                               li: 3.0
                                                    xi: 2.5
                                                                                                    tail of i: 4.0
                                                                                                                              gama_i0: 14.0
                                                                                                                                                           gama_i1: 18.0
                                                         demand i: 160.0
                                                                                                                         work load gap_i: 0
                     duration time i: 4.0
                                                                                        work load i: 160.0
132
                                                                        bow of i: 0.3
                                                                                                                              gama_i0: 18.0
           V id: 8
                               li: 4.0
                                                    xi: 2.3
                                                                                                    tail of i: 4.3
                                                                                                                                                           gama_i1: 20.0
                     duration time i: 2.0
                                                         demand i: 60.0
                                                                                        work load i: 60.0
                                                                                                                         work load gap i: 0
           V_id: 9
133
                                                    xi: 3.7
                               li: 3.0
                                                                        bow of i: 2.2
                                                                                                    tail of i: 5.2
                                                                                                                              gama i0: 4.0
                                                                                                                                                           gama i1: 6.0
                                                        demand_i: 80.0
                                                                                        work load_i: 80.0
                                                                                                                         work load gap_i: 0
                     duration_time_i: 2.0
           V_id: 10
134
                                                                           bow of i: 0.5
                                  li: 9.0
                                                       xi: 5.0
                                                                                                       tail of i: 9.5
                                                                                                                                 gama_i0: 8.0
                                                                                                                                                             gama_i1: 9.0
                                                         demand_i: 120.0
                                                                                        work load_i: 120.0
                                                                                                                         work load gap_i: 0
                     duration_time_i: 1.0
135
           V id: 11
                                                                           bow of i: 0.2
                                                                                                       tail of i: 6.2
                                                                                                                                 gama i0: 9.0
                                 li: 6.0
                                                      xi: 3.2
                                                                                                                                                             gama i1: 10.
     0
                     duration_time_i: 1.0
                                                        demand i: 60.0
                                                                                        work load i: 60.0
                                                                                                                         work load gap i: 0
136
                                                                                                                                   gama_i0: 4.0
           V id: 12
                                  li: 6.0
                                                      xi: 8.3
                                                                           bow of i: 5.3
                                                                                                       tail of i: 11.3
                                                                                                                                                                gama i1:5
                                                                                          work load_i: 100.0
     .0
                       duration_time_i: 1.0
                                                           demand_i: 100.0
                                                                                                                            work load gap_i: 0
137
                                                      xi: 3.2
                                                                           bow of i: 1.2
                                                                                                                                 gama_i0: 13.0
           V_id: 13
                                 li: 4.0
                                                                                                       tail of i: 5.2
                                                                                                                                                             gama_i1: 14.
                                                         demand_i: 80.0
                     duration_time_i: 1.0
                                                                                        work load_i: 80.0
                                                                                                                         work load gap_i: 0
     0
138
139
    Algorithm finished and the total CPU time: 1310 s
140 End
141
```