```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=35811
 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_20_4_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 = 60
       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 = 0.100000000000000000
31
32
33
34
   Iteration begin:
35
   Beging the No. 0 iteration:
     obj[0] = 159.60 temp_best_value_gen = 159.60
36
     The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
40
     obj[gen-1] = 159.60 temp_best_value_gen = 159.60
     No, maintain solution and \overline{obj}[\overline{gen}] = 159.60, and the tolerance counter = 1
41
42
     solution chromosome =
43
       first level: [ [ 2.58 7.26 4.63 6.06 3.09 3.27 2.93 8.86 4.8 3.26 8.58 6.81
    2.32 1.84 16. 15.5 5. 13.5 16. 15.5 ]
44
45
       second level: [5. 1. 3. 8. 12. 15. 17. 5. 20. 22. 26. 27. 29. 33. 2. 6. 0. 8.
46
    10.12.1
47
       third level: [2. 3. 2. 2. 3. 4. 3. 7. 3. 2. 6. 7. 2. 2. 3. 6. 6. 2. 4. 3.]]
48
     The No. 1 iteration is finished!
49
50
   Beging the No. 2 iteration:
51
     obi[gen-1] = 159.60 temp best value gen = 159.60
     No, maintain solution and obj[gen] = 159.60, and the tolerance_counter = 2
52
53
     solution chromosome =
54
       first level: [ [ 2.58 7.26 4.63 6.06 3.09 3.27 2.93 8.86 4.8 3.26 8.58 6.81
55
    2.32 1.84 16. 15.5 5. 13.5 16. 15.5 ]
       second level: [5. 1. 3. 8. 12. 15. 17. 5. 20. 22. 26. 27. 29. 33. 2. 6. 0. 8.
56
57
    10. 12.]
58
       third level: [2. 3. 2. 2. 3. 4. 3. 7. 3. 2. 6. 7. 2. 2. 3. 6. 6. 2. 4. 3.]]
59
     The No. 2 iteration is finished!
60
   Beging the No. 3 iteration:
61
     obi[gen-1] = 159.60 temp best value gen = 159.60
62
63
     No, maintain solution and obj[gen] = 159.60, and the tolerance_counter = 3
64
     solution chromosome =
       first level: [ [ 2.58 7.26 4.63 6.06 3.09 3.27 2.93 8.86 4.8 3.26 8.58 6.81
65
    2.32 1.84 16. 15.5 5. 13.5 16. 15.5 ]
66
67
        second level: [5. 1. 3. 8. 12. 15. 17. 5. 20. 22. 26. 27. 29. 33. 2. 6. 0. 8.
68
    10. 12.]
69
       third level: [2. 3. 2. 2. 3. 4. 3. 7. 3. 2. 6. 7. 2. 2. 3. 6. 6. 2. 4. 3.]]
     The No. 3 iteration is finished!
70
71
   Beging the No. 4 iteration:
73
     obj[gen-1] = 159.60 temp_best_value_gen = 159.60
74
     No, maintain solution and obj[gen] = 159.60, and the tolerance_counter = 4
75
     solution chromosome =
       first level: [ [ 2.58 7.26 4.63 6.06 3.09 3.27 2.93 8.86 4.8 3.26 8.58 6.81
76
    2.32 1.84 16. 15.5 5. 13.5 16. 15.5 ]
77
        second level: [5. 1. 3. 8. 12. 15. 17. 5. 20. 22. 26. 27. 29. 33. 2. 6. 0. 8.
78
79
    10.12.]
```

```
80
          third level: [2. 3. 2. 2. 3. 4. 3. 7. 3. 2. 6. 7. 2. 2. 3. 6. 6. 2. 4. 3.]]
 81
        The No. 4 iteration is finished!
 82
 83
     Beging the No. 5 iteration:
       obj[gen-1] = 159.60 temp best value gen = 159.60
 84
 85
       No, maintain solution and obj[gen] = 159.60, and the tolerance counter = 5
 86
       solution chromosome =
          first level: [ [ 2.58 7.26 4.63 6.06 3.09 3.27 2.93 8.86 4.8 3.26 8.58 6.81
 87
 88
      2.32 1.84 16. 15.5 5. 13.5 16. 15.5 ]
 89
          second level: [5. 1. 3. 8. 12. 15. 17. 5. 20. 22. 26. 27. 29. 33. 2. 6. 0. 8.
      10.12.]
 90
 91
          third level: [2. 3. 2. 2. 3. 4. 3. 7. 3. 2. 6. 7. 2. 2. 3. 6. 6. 2. 4. 3.]]
 92
        The No. 5 iteration is finished!
 93
 94
     Beging the No. 6 iteration:
 95
       obj[gen-1] = 159.60 temp_best_value_gen = 159.60
       No, maintain solution and obj[gen] = 159.60, and the tolerance_counter = 6
 96
 97
       solution chromosome =
 98
          first level: [ [ 2.58 7.26 4.63 6.06 3.09 3.27 2.93 8.86 4.8 3.26 8.58 6.81
 99
      2.32 1.84 16. 15.5 5. 13.5 16. 15.5 ]
          second level: [5. 1. 3. 8. 12. 15. 17. 5. 20. 22. 26. 27. 29. 33. 2. 6. 0. 8.
100
101
      10.12.1
102
          third level: [2. 3. 2. 2. 3. 4. 3. 7. 3. 2. 6. 7. 2. 2. 3. 6. 6. 2. 4. 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: [ [ 2.58 7.26 4.63 6.06 3.09 3.27 2.93 8.86 4.8 3.26 8.58 6.81
109
110
      2.32 1.84 16. 15.5 5. 13.5 16. 15.5 ]
          second level: [5. 1. 3. 8. 12. 15. 17. 5. 20. 22. 26. 27. 29. 33. 2. 6. 0. 8.
111
112
      10.12.]
113
          third level: [2. 3. 2. 2. 3. 4. 3. 7. 3. 2. 6. 7. 2. 2. 3. 6. 6. 2. 4. 3.]]
114
        Objective function values and some other indicators:
                                Obj1 = 930.96
                                                          Obj0 + Obj1 = 965.96
115
          Obi0 = 35.00
116
          Total movement of crane: 50.96
117
          Total waiting time in berth position: 261.00
118
          Total index of q during berthing: 617.00
119
        Specific arrangement for each vessel:
                              1i: 3.0
                                                                                                                            gama_i0: 5.0
120
          V_id: 0
                                                                       bow of i: 1.1
                                                                                                  tail of i: 4.1
                                                                                                                                                        gama_i1: 8.0
                                                       demand i: 100.0
                                                                                      work load i: 100.0
                                                                                                                       work load gap i: 0
                    duration time i: 3.0
121
          V id: 1
                                                   xi: 73
                                                                       bow of i: 2.8
                                                                                                                                                          gama_i1: 3.0
                              1i: 9.0
                                                                                                  tail of i: 11.8
                                                                                                                              gama i0: 1.0
                    duration_time_i: 2.0
                                                        demand i: 80.0
                                                                                      work load i: 80.0
                                                                                                                       work load gap_i: 0
122
          V_id: 2
                              li: 5.0
                                                   xi: 4.6
                                                                       bow of i: 2.1
                                                                                                  tail of i: 7.1
                                                                                                                            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
123
          V_id: 3
                              li: 7.0
                                                   xi: 6.1
                                                                       bow of i: 2.6
                                                                                                  tail of i: 9.6
                                                                                                                            gama_i0: 8.0
                                                                                                                                                        gama_i1: 12.0
                    duration_time_i: 4.0
                                                       demand_i: 140.0
                                                                                      work load_i: 140.0
                                                                                                                       work load gap_i: 0
124
          V_id: 4
                                                                       bow of i: 1.1
                                                                                                  tail of i: 5.1
                                                                                                                            gama i0: 12.0
                                                                                                                                                        gama i1: 15.0
                              li: 4.0
                                                   xi: 3.1
                    duration time i: 3.0
                                                       demand i: 160.0
                                                                                      work load i: 160.0
                                                                                                                       work load gap_i: 0
125
          V id: 5
                              li: 4.0
                                                   xi: 3.3
                                                                       bow of i: 1.3
                                                                                                  tail of i: 5.3
                                                                                                                            gama i0: 15.0
                                                                                                                                                        gama i1: 17.0
                    duration_time_i: 2.0
                                                       demand_i: 160.0
                                                                                      work load_i: 160.0
                                                                                                                       work load gap_i: 0
126
                                                                       bow of i: 1.4
                                                                                                                            gama i0: 17.0
          V id: 6
                              li: 3.0
                                                   xi: 2.9
                                                                                                  tail of i: 4.4
                                                                                                                                                        gama i1: 20.0
                    duration_time_i: 3.0
                                                        demand_i: 160.0
                                                                                      work load_i: 160.0
                                                                                                                       work load gap_i: 0
127
          V_id: 7
                              li: 9.0
                                                                       bow of i: 4.4
                                                                                                  tail of i: 13.4
                                                                                                                              gama_i0: 5.0
                                                                                                                                                          gama_i1: 6.0
                                                   xi: 8.9
                    duration time i: 1.0
                                                       demand i: 140.0
                                                                                      work load i: 140.0
                                                                                                                       work load gap i: 0
128
          V id: 8
                              li: 7.0
                                                   xi: 4.8
                                                                       bow of i: 1.3
                                                                                                  tail of i: 8.3
                                                                                                                            gama_i0: 20.0
                                                                                                                                                        gama i1: 22.0
                    duration_time_i: 2.0
                                                       demand_i: 100.0
                                                                                      work load_i: 100.0
                                                                                                                       work load gap_i: 0
129
          V_id: 9
                              li: 4.0
                                                   xi: 3.3
                                                                       bow of i: 1.3
                                                                                                  tail of i: 5.3
                                                                                                                            gama_i0: 22.0
                                                                                                                                                        gama_i1: 26.0
                    duration_time i: 4.0
                                                       demand i: 140.0
                                                                                      work load i: 140.0
                                                                                                                       work load gap_i: 0
                                                                                                     tail of i: 13.1
130
          V_id: 10
                                li: 9.0
                                                     xi: 8.6
                                                                         bow of i: 4.1
                                                                                                                                 gama_i0: 26.0
                                                                                                                                                             gama_i1:
     27.0
                         duration time i: 1.0
                                                             demand i: 80.0
                                                                                           work load i: 80.0
                                                                                                                            work load gap_i: 0
131
          V id: 11
                                li: 8.0
                                                                         bow of i: 2.8
                                                                                                     tail of i: 10.8
                                                                                                                                 gama i0: 27.0
                                                                                                                                                             gama i1:
     29.0
                                                            demand_i: 160.0
                                                                                           work load_i: 160.0
                                                                                                                            work load gap_i: 0
                         duration time i: 2.0
                                                     xi: 2.3
132
          V_id: 12
                                 li: 3.0
                                                                         bow of i: 0.8
                                                                                                     tail of i: 3.8
                                                                                                                              gama_i0: 29.0
                                                                                                                                                          gama_i1: 33.
                                                       demand_i: 140.0
                                                                                      work load i: 140.0
                                                                                                                       work load gap_i: 0
     0
                    duration_time_i: 4.0
133
          V id: 13
                                                                         bow of i: 0.3
                                li: 3.0
                                                     xi: 1.8
                                                                                                     tail of i: 3.3
                                                                                                                              gama i0: 33.0
                                                                                                                                                          gama_i1: 36.
     0
                                                       demand i: 100.0
                                                                                      work load_i: 100.0
                                                                                                                       work load gap_i: 0
                    duration_time_i: 3.0
134
          V id: 14
                                 li: 8.0
                                                     xi: 16.0
                                                                            bow of i: 12.0
                                                                                                        tail of i: 20.0
                                                                                                                                   gama i0: 2.0
                                                                                                                                                               gama il
                                                            demand_i: 80.0
     : 4.0
                         duration_time_i: 2.0
                                                                                           work load_i: 80.0
                                                                                                                            work load gap_i: 0
135
                                                                                                       tail of i: 19.0
          V_id: 15
                                                                           bow of i: 12.0
                                                                                                                                   gama_i0: 6.0
                                li: 7.0
                                                     xi: 15.5
                                                                                                                                                               gama_i1
                         duration_time_i: 2.0
     : 8.0
                                                             demand_i: 160.0
                                                                                           work load i: 160.0
                                                                                                                            work load gap_i: 0
136
                                                     xi: 5.0
                                                                                                                                                          gama_i1: 1.0
          V_id: 16
                                 li: 9.0
                                                                         bow of i: 0.5
                                                                                                     tail of i: 9.5
                                                                                                                              gama_i0: 0.0
                                                       demand_i: 60.0
                    duration_time_i: 1.0
                                                                                      work load i: 60.0
                                                                                                                       work load gap_i: 0
137
          V_id: 17
                                                                            bow of i: 12.0
                                                                                                       tail of i: 15.0
                                                                                                                                   gama_i0: 8.0
                                li: 3.0
                                                                                                                                                               gama_i1
                                                     xi: 13.5
     : 10.0
                         duration time i: 2.0
                                                             demand i: 60.0
                                                                                           work load i: 60.0
                                                                                                                            work load gap i: 0
                                                                                                                                   gama_i0: 10.0
138
          V_id: 18
                                li: 8.0
                                                                            bow of i: 12.0
                                                                                                       tail of i: 20.0
                                                                                                                                                               gama_i1
     : 12.0
                         duration time i: 2.0
                                                             demand_i: 140.0
                                                                                           work load_i: 140.0
                                                                                                                            work load gap_i: 0
                                                                            bow of i: 13.5
139
          V_id: 19
                                 li: 4.0
                                                     xi: 15.5
                                                                                                        tail of i: 17.5
                                                                                                                                   gama_i0: 12.0
                                                                                                                                                               gama_i1
                         duration_time_i: 3.0
                                                             demand i: 140.0
                                                                                           work load i: 140.0
                                                                                                                            work load gap_i: 0
140
141 Algorithm finished and the total CPU time: 1327 s
142 End
143
```