```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=49931
 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_20_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 = 60
24
       Iter_num_GA = 300
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
   Iteration begin:
34
35
   Beging the No. 0 iteration:
     obj[0] = 181.30 temp_best_value_gen = 181.30
36
     The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
40
     obj[gen-1] = 181.30 temp_best_value_gen = 181.30
41
     No, maintain solution and obj[gen] = 181.30, and the tolerance counter = 1
42
     solution chromosome =
43
        first level: [ [ 4. 10. 15.5 4.5 26. 2.5 4.5 4. 23.5 3. 4.5 2.5 1.5 3.5
44
    1.5 1.5 4.5 14. 13.5 13.5]
        second\ level;\ [\ 1.\ \ 5.\ \ 0.\ \ 3.\ \ 0.\ \ 7.\ 11.\ \ 5.\ \ 4.\ \ 0.\ 13.\ 15.\ 17.\ 21.\ 25.\ 29.\ 32.\ \ 3.
45
46
    16. 6.]
47
       third level: [3. 4. 7. 5. 2. 2. 4. 5. 5. 6. 4. 5. 2. 2. 2. 2. 2. 2. 2. 2.]
48
     The No. 1 iteration is finished!
49
50
   Beging the No. 2 iteration:
51
     obi[gen-1] = 181.30 temp best value gen = 181.30
     No, maintain solution and obj[gen] = 181.30, and the tolerance_counter = 2
52
53
     solution chromosome =
54
        first level: [ [ 4. 10. 15.5 4.5 26. 2.5 4.5 4. 23.5 3. 4.5 2.5 1.5 3.5
55
    1.5 1.5 4.5 14. 13.5 13.5]
56
        second level: [ 1. 5. 0. 3. 0. 7. 11. 5. 4. 0. 13. 15. 17. 21. 25. 29. 32. 3.
57
58
       third level: [3. 4. 7. 5. 2. 2. 4. 5. 5. 6. 4. 5. 2. 2. 2. 2. 2. 2. 2. 2. ]
59
     The No. 2 iteration is finished!
60
   Beging the No. 3 iteration:
61
62
     obi[gen-1] = 181.30 temp best value gen = 181.30
63
     No, maintain solution and obj[gen] = 181.30, and the tolerance_counter = 3
64
     solution chromosome =
        first level: [ [ 4. 10. 15.5 4.5 26. 2.5 4.5 4. 23.5 3. 4.5 2.5 1.5 3.5
65
    1.5 1.5 4.5 14. 13.5 13.5]
66
67
        second level: [ 1. 5. 0. 3. 0. 7. 11. 5. 4. 0. 13. 15. 17. 21. 25. 29. 32. 3.
68
69
       third level: [3. 4. 7. 5. 2. 2. 4. 5. 5. 6. 4. 5. 2. 2. 2. 2. 2. 2. 2. 2. ]
     The No. 3 iteration is finished!
70
71
   Beging the No. 4 iteration:
73
     obj[gen-1] = 181.30 temp_best_value_gen = 181.30
74
     No, maintain solution and obj[gen] = 181.30, and the tolerance_counter = 4
75
     solution chromosome =
       first level: [ [ 4. 10. 15.5 4.5 26. 2.5 4.5 4. 23.5 3. 4.5 2.5 1.5 3.5
76
    1.5 1.5 4.5 14. 13.5 13.5]
77
        second level: [ 1. 5. 0. 3. 0. 7. 11. 5. 4. 0. 13. 15. 17. 21. 25. 29. 32. 3.
78
79
    16. 6.]
```

```
80
          third level: [3. 4. 7. 5. 2. 2. 4. 5. 5. 6. 4. 5. 2. 2. 2. 2. 2. 2. 2. 2. ]
 81
        The No. 4 iteration is finished!
 82
 83
     Beging the No. 5 iteration:
       obj[gen-1] = 181.30 temp_best_value_gen = 181.30
 84
 85
       No, maintain solution and obj[gen] = 181.30, and the tolerance counter = 5
 86
       solution chromosome =
 87
          first level: [ [ 4. 10. 15.5 4.5 26. 2.5 4.5 4. 23.5 3. 4.5 2.5 1.5 3.5
 88
      1.5 1.5 4.5 14. 13.5 13.5]
 89
          second level: [1. 5. 0. 3. 0. 7. 11. 5. 4. 0. 13. 15. 17. 21. 25. 29. 32. 3.
 90
      16. 6.1
 91
          third level: [3. 4. 7. 5. 2. 2. 4. 5. 5. 6. 4. 5. 2. 2. 2. 2. 2. 2. 2. 2.]]
 92
        The No. 5 iteration is finished!
 93
 94
     Beging the No. 6 iteration:
 95
       obj[gen-1] = 181.30 temp_best_value_gen = 181.30
       No, maintain solution and obj[gen] = 181.30, and the tolerance_counter = 6
 96
 97
        solution chromosome =
 98
          first level: [ [ 4. 10. 15.5 4.5 26. 2.5 4.5 4. 23.5 3. 4.5 2.5 1.5 3.5
 99
      1.5 1.5 4.5 14. 13.5 13.5]
100
          second level: [1. 5. 0. 3. 0. 7. 11. 5. 4. 0. 13. 15. 17. 21. 25. 29. 32. 3.
101
      16. 6.]
          third level: [3. 4. 7. 5. 2. 2. 4. 5. 5. 6. 4. 5. 2. 2. 2. 2. 2. 2. 2. 2.]]
102
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: [ [ 4. 10. 15.5 4.5 26. 2.5 4.5 4. 23.5 3. 4.5 2.5 1.5 3.5
109
110
      1.5 1.5 4.5 14. 13.5 13.5]
          second level: [1. 5. 0. 3. 0. 7. 11. 5. 4. 0. 13. 15. 17. 21. 25. 29. 32. 3.
111
112
113
          third level: [3. 4. 7. 5. 2. 2. 4. 5. 5. 6. 4. 5. 2. 2. 2. 2. 2. 2. 2. 2. ]
114
       Objective function values and some other indicators:
                                                          Obj0 + Obj1 = 1201.00
115
          Obi0 = 34.00
                                 Obj1 = 1167.00
116
          Total movement of crane: 25.00
117
          Total waiting time in berth position: 213.00
118
          Total index of q during berthing: 713.00
119
        Specific arrangement for each vessel:
120
                                                                                                                            gama_i0: 1.0
          V_id: 0
                              li: 8.0
                                                                       bow of i: 0.0
                                                                                                   tail of i: 8.0
                                                                                                                                                        gama_i1: 3.0
                    duration time i: 2.0
                                                       demand i: 80.0
                                                                                      work load i: 80.0
                                                                                                                       work load gap i: 0
          V_id: 1
121
                                                                         bow of i: 8.0
                              1i: 4.0
                                                   xi: 10.0
                                                                                                     tail of i: 12.0
                                                                                                                                 gama i0: 5.0
                                                                                                                                                             gama_i1: 7
     .0
                       duration_time_i: 2.0
                                                          demand i: 120.0
                                                                                         work load i: 120.0
                                                                                                                          work load gap_i: 0
122
          V_id: 2
                              li: 7.0
                                                   xi: 15.5
                                                                         bow of i: 12.0
                                                                                                     tail of i: 19.0
                                                                                                                                 gama_i0: 0.0
                                                                                                                                                             gama_i1: 1
                                                                                         work load_i: 120.0
     .0
                       duration time i: 1.0
                                                          demand_i: 120.0
                                                                                                                          work load gap_i: 0
123
          V_id: 3
                              li: 9.0
                                                   xi: 4.5
                                                                       bow of i: 0.0
                                                                                                   tail of i: 9.0
                                                                                                                            gama_i0: 3.0
                                                                                                                                                        gama_i1: 4.0
                                                        demand_i: 100.0
                    duration_time_i: 1.0
                                                                                      work load_i: 100.0
                                                                                                                       work load gap_i: 0
124
          V_id: 4
                                                                         bow of i: 22.0
                                                                                                     tail of i: 30.0
                                                                                                                                 gama i0: 0.0
                              li: 8.0
                                                   xi: 26.0
                                                                                                                                                             gama_i1: 4
     .0
                       duration_time_i: 4.0
                                                          demand i: 160.0
                                                                                         work load i: 160.0
                                                                                                                          work load gap i: 0
125
          V_id: 5
                              li: 5.0
                                                   xi: 2.5
                                                                       bow of i: 0.0
                                                                                                   tail of i: 5.0
                                                                                                                            gama i0: 7.0
                                                                                                                                                        gama i1: 11.0
                    duration_time_i: 4.0
                                                        demand_i: 160.0
                                                                                      work load_i: 160.0
                                                                                                                       work load gap_i: 0
          V id: 6
126
                              li: 9.0
                                                   xi: 4.5
                                                                       bow of i: 0.0
                                                                                                   tail of i: 9.0
                                                                                                                            gama i0: 11.0
                                                                                                                                                        gama i1: 13.0
                    duration_time_i: 2.0
                                                        demand_i: 140.0
                                                                                      work load_i: 140.0
                                                                                                                       work load gap_i: 0
127
          V_id: 7
                                                                       bow of i: 0.0
                                                                                                   tail of i: 8.0
                                                                                                                                                        gama i1: 6.0
                              li: 8.0
                                                   xi: 4.0
                                                                                                                            gama_i0: 5.0
                    duration time i: 1.0
                                                       demand i: 80.0
                                                                                      work load i: 80.0
                                                                                                                       work load gap i: 0
128
          V id: 8
                                                   xi: 23.5
                                                                         bow of i: 20.5
                                                                                                     tail of i: 26.5
                                                                                                                                 gama_i0: 4.0
                                                                                                                                                             gama_i1: 5
                              li: 6.0
     .0
                       duration_time_i: 1.0
                                                          demand_i: 100.0
                                                                                         work load_i: 100.0
                                                                                                                          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: 0.0
                                                                                                                                                        gama_i1: 1.0
                    duration_time_i: 1.0
                                                       demand_i: 100.0
                                                                                      work load i: 100.0
                                                                                                                       work load gap_i: 0
130
          V_id: 10
                                 li: 9.0
                                                     xi: 4.5
                                                                         bow of i: 0.0
                                                                                                     tail of i: 9.0
                                                                                                                               gama_i0: 13.0
                                                                                                                                                           gama_i1: 15.
     0
                                                        demand i: 120.0
                                                                                                                       work load gap_i: 0
                    duration time i: 2.0
                                                                                      work load i: 120.0
131
                                 li: 5.0
                                                     xi: 2.5
          V id: 11
                                                                         bow of i: 0.0
                                                                                                     tail of i: 5.0
                                                                                                                               gama i0: 15.0
                                                                                                                                                           gama i1:17.
     0
                                                       demand_i: 160.0
                                                                                                                       work load gap_i: 0
                    duration time i: 2.0
                                                                                      work load i: 160.0
                                                     xi: 1.5
132
          V_id: 12
                                 li: 3.0
                                                                         bow of i: 0.0
                                                                                                     tail of i: 3.0
                                                                                                                               gama_i0: 17.0
                                                                                                                                                           gama_i1: 21.
     0
                                                       demand_i: 140.0
                    duration_time_i: 4.0
                                                                                      work load_i: 140.0
                                                                                                                       work load gap_i: 0
133
          V id: 13
                                                                         bow of i: 0.0
                                                                                                                               gama i0: 21.0
                                                                                                                                                           gama_i1: 25.
                                 li: 7.0
                                                     xi: 3.5
                                                                                                     tail of i: 7.0
     0
                    duration_time_i: 4.0
                                                       demand i: 140.0
                                                                                      work load i: 140.0
                                                                                                                       work load gap_i: 0
                                                     xi: 1.5
134
          V id: 14
                                 li: 3.0
                                                                         bow of i: 0.0
                                                                                                      tail of i: 3.0
                                                                                                                               gama i0: 25.0
                                                                                                                                                           gama i1: 29.
     0
                    duration_time_i: 4.0
                                                       demand_i: 140.0
                                                                                      work load_i: 140.0
                                                                                                                       work load gap_i: 0
135
          V_id: 15
                                                                         bow of i: 0.0
                                                                                                                               gama_i0: 29.0
                                                                                                     tail of i: 3.0
                                                                                                                                                           gama i1: 32.
                                 li: 3.0
                                                     xi: 1.5
                                                        demand\_i{:}\ 100.0
     0
                    duration_time_i: 3.0
                                                                                      work load_i: 100.0
                                                                                                                       work load gap_i: 0
136
          V id: 16
                                 li: 9.0
                                                     xi: 4.5
                                                                         bow of i: 0.0
                                                                                                     tail of i: 9.0
                                                                                                                               gama_i0: 32.0
                                                                                                                                                           gama_i1: 35.
     0
                                                       demand i: 100.0
                                                                                      work load i: 100.0
                    duration_time_i: 3.0
                                                                                                                       work load gap_i: 0
137
          V_id: 17
                                                                            bow of i: 12.0
                                                                                                                                    gama_i0: 3.0
                                 1i: 4 0
                                                                                                        tail of i: 16.0
                                                     xi: 14 0
                                                                                                                                                                gama il
     : 6.0
                         duration time i: 3.0
                                                             demand i: 100.0
                                                                                           work load i: 100.0
                                                                                                                            work load gap i: 0
                                                                                                                                    gama_i0: 16.0
138
          V_id: 18
                                 li: 3.0
                                                                            bow of i: 12.0
                                                                                                       tail of i: 15.0
                                                                                                                                                                gama_i1
     : 20.0
                         duration time i: 4.0
                                                             demand_i: 140.0
                                                                                           work load_i: 140.0
                                                                                                                            work load gap_i: 0
139
                                                                            bow of i: 12.0
          V_id: 19
                                 li: 3.0
                                                     xi: 13.5
                                                                                                        tail of i: 15.0
                                                                                                                                    gama_i0: 6.0
                                                                                                                                                                gama_i1
                         duration_time_i: 3.0
                                                             demand i: 120.0
                                                                                           work load i: 120.0
                                                                                                                            work load gap_i: 0
140
141 Algorithm finished and the total CPU time: 1318 s
142 End
```

143