```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=43395
 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'])
 5
6
   PyDev console: starting.
8 Python 3.9.7 (tags/v3.9.7:1016ef3, Aug 30 2021, 20:19:38) [MSC v.1929 64 bit (AMD64)] on win32
   python code/01_My_Python_Code')
10 Backend TkAgg is interactive backend. Turning interactive mode on.
   Waiting 1s....
12
13
   This is the R_18_5 standard_test.xlsx optimization process solved by ENSGA-II algorithm.
14
15
   Start
16
17 Before iteration:
18
     Read basic data
19
     Parameter setting:
20
        trail = 58
21
        Pop_size = 30
        Tolerance iteration unchanged number = 10
23
        Chrom size = 54
       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] = 89.25 temp_best_value_gen = 89.25
36
     The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
     obj[gen-1] = 89.25 temp_best_value_gen = 89.25
40
     No, maintain solution and obj[gen] = 89.25, and the tolerance counter = 1
41
42
     solution chromosome =
43
        first level: [ [ 4.13 3.69 1.51 1.98 4.16 1.7 3.58 7.19 3.58 6.88 2.56 4.03
    9. 9. 9.5 11. 8.5 9.5]
44
        second level: [ 3. 15. 1. 5. 10. 12. 19. 23. 27. 1. 31. 7. 2. 4. 7. 12. 28. 16.]
45
46
       third level: [3. 2. 3. 2. 4. 3. 2. 2. 2. 7. 2. 3. 3. 2. 3. 2. 2. 4.]]
47
     The No. 1 iteration is finished!
48
   Beging the No. 2 iteration:
49
50
     obj[gen-1] = 89.25 temp_best_value_gen = 89.25
51
     No, maintain solution and obj[gen] = 89.25, and the tolerance counter = 2
52
     solution chromosome =
53
         first \ level: \hbox{\tt [[4.13\ 3.69\ 1.51\ 1.98\ 4.16\ 1.7\ 3.58\ 7.19\ 3.58\ 6.88\ 2.56\ 4.03] } 
54
        9. 9.5 11. 8.5 9.5]
       second level: [3. 15. 1. 5. 10. 12. 19. 23. 27. 1. 31. 7. 2. 4. 7. 12. 28. 16.]
55
        third level: [3. 2. 3. 2. 4. 3. 2. 2. 2. 7. 2. 3. 3. 2. 3. 2. 2. 4.]]
56
57
     The No. 2 iteration is finished!
58
59 Beging the No. 3 iteration:
     obj[gen-1] = 89.25 temp_best_value_gen = 89.25
60
     No, maintain solution and obj[gen] = 89.25, and the tolerance_counter = 3
61
62
     solution chromosome =
       first level: [ [ 4.13 3.69 1.51 1.98 4.16 1.7 3.58 7.19 3.58 6.88 2.56 4.03
63
64
       9. 9.5 11. 8.5 9.5]
        second level: [ 3. 15. 1. 5. 10. 12. 19. 23. 27. 1. 31. 7. 2. 4. 7. 12. 28. 16.]
65
       third level: [3. 2. 3. 2. 4. 3. 2. 2. 2. 7. 2. 3. 3. 2. 3. 2. 2. 4.]]
66
67
     The No. 3 iteration is finished!
68
69 Beging the No. 4 iteration:
     obj[gen-1] = 89.25 temp_best_value_gen = 89.25
70
71
     No, maintain solution and obj[gen] = 89.25, and the tolerance counter = 4
     solution chromosome =
       first level: [ [ 4.13 3.69 1.51 1.98 4.16 1.7 3.58 7.19 3.58 6.88 2.56 4.03
73
    9. 9. 9.5 11. 8.5 9.5]
74
        second level: [3. 15. 1. 5. 10. 12. 19. 23. 27. 1. 31. 7. 2. 4. 7. 12. 28. 16.]
75
       third level: [3. 2. 3. 2. 4. 3. 2. 2. 2. 7. 2. 3. 3. 2. 3. 2. 2. 4.]]
76
     The No. 4 iteration is finished!
77
78
   Beging the No. 5 iteration:
79
```

```
obj[gen-1] = 89.25 temp_best_value_gen = 89.25
 81
       No, maintain solution and obj[gen] = 89.25, and the tolerance counter = 5
 82
       solution chromosome =
 83
          first level: [ [ 4.13 3.69 1.51 1.98 4.16 1.7 3.58 7.19 3.58 6.88 2.56 4.03
               9.5 11. 8.5 9.5]
 84
 85
          second level: [3. 15. 1. 5. 10. 12. 19. 23. 27. 1. 31. 7. 2. 4. 7. 12. 28. 16.]
          third level: [3. 2. 3. 2. 4. 3. 2. 2. 2. 7. 2. 3. 3. 2. 3. 2. 2. 4.]]
 86
 87
       The No. 5 iteration is finished!
 88
 89
     Beging the No. 6 iteration:
       obj[gen-1] = 89.25 temp_best_value_gen = 89.25
 90
 91
        No, maintain solution and obj[gen] = 89.25, and the tolerance_counter = 6
 92
       solution chromosome =
 93
          first level: [ [ 4.13 3.69 1.51 1.98 4.16 1.7 3.58 7.19 3.58 6.88 2.56 4.03
 94
          9. 9.5 11. 8.5 9.5]
 95
          second level: [3. 15. 1. 5. 10. 12. 19. 23. 27. 1. 31. 7. 2. 4. 7. 12. 28. 16.]
 96
          third level: [3. 2. 3. 2. 4. 3. 2. 2. 2. 7. 2. 3. 3. 2. 3. 2. 2. 4.]]
 97
        The No. 6 iteration is finished!
 98
 99
100
101
    The iteration is terminated and then visulize the solution:
102
        solution chromosome =
          first level: [ [ 4.13 3.69 1.51 1.98 4.16 1.7 3.58 7.19 3.58 6.88 2.56 4.03
103
104
          9. 9.5 11. 8.5 9.5]
          second level: [ 3. 15. 1. 5. 10. 12. 19. 23. 27. 1. 31. 7. 2. 4. 7. 12. 28. 16.]
105
          third level: [3. 2. 3. 2. 4. 3. 2. 2. 2. 7. 2. 3. 3. 2. 3. 2. 2. 4.]]
106
107
        Objective function values and some other indicators:
                                Obj1 = 246.54
                                                          Obj0 + Obj1 = 280.54
108
          Obi0 = 34.00
109
          Total movement of crane: 23.54
110
          Total waiting time in berth position: 223.00
111
          Total index of q during berthing: 389.00
112
        Specific arrangement for each vessel:
                                                                                                                            gama_i0: 3.0
113
          V_id: 0
                              li: 5.0
                                                  xi: 4.1
                                                                       bow of i: 1.6
                                                                                                  tail of i: 6.6
                                                                                                                                                        gama_i1: 5.0
                                                       demand_i: 100.0
                    duration_time_i: 2.0
                                                                                      work load i: 100.0
                                                                                                                       work load gap i: 0
114
          V_id: 1
                                                                       bow of i: 1.2
                              li: 5.0
                                                   xi: 3.7
                                                                                                  tail of i: 6.2
                                                                                                                            gama_i0: 15.0
                                                                                                                                                        gama_i1: 19.0
                    duration_time_i: 4.0
                                                        demand i: 140.0
                                                                                      work load i: 140.0
                                                                                                                       work load gap i: 0
115
          V id: 2
                              li: 3.0
                                                   xi: 1.5
                                                                       bow of i: 0.0
                                                                                                  tail of i: 3.0
                                                                                                                            gama i0: 1.0
                                                                                                                                                        gama i1: 3.0
                                                                                                                       work load gap_i: 0
                    duration_time_i: 2.0
                                                        demand i: 100.0
                                                                                      work load i: 100.0
116
          V_id: 3
                              li: 3.0
                                                   xi: 2.0
                                                                       bow of i: 0.5
                                                                                                  tail of i: 3.5
                                                                                                                            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
117
          V_id: 4
                                                                       bow of i: 0.7
                                                                                                                            gama_i0: 10.0
                              li: 7.0
                                                   xi: 4.2
                                                                                                  tail of i: 7.7
                                                                                                                                                        gama i1: 12.0
                                                       demand i: 100.0
                    duration_time_i: 2.0
                                                                                      work load i: 100.0
                                                                                                                       work load gap i: 0
118
          V id: 5
                              li: 3.0
                                                                       bow of i: 0.2
                                                                                                  tail of i: 3.2
                                                                                                                            gama_i0: 12.0
                                                                                                                                                        gama_i1: 15.0
                                                   xi: 1.7
                    duration_time_i: 3.0
                                                       demand_i: 140.0
                                                                                      work load_i: 140.0
                                                                                                                       work load gap_i: 0
119
          V_id: 6
                              li: 7.0
                                                   xi: 3.6
                                                                       bow of i: 0.1
                                                                                                  tail of i: 7.1
                                                                                                                            gama_i0: 19.0
                                                                                                                                                        gama_i1: 23.0
                    duration_time_i: 4.0
                                                        demand_i: 140.0
                                                                                      work load_i: 140.0
                                                                                                                       work load gap_i: 0
                                                                       bow of i: 2.7
                                                                                                  tail of i: 11.7
120
          V id: 7
                              li: 9.0
                                                   xi: 7.2
                                                                                                                              gama_i0: 23.0
                                                                                                                                                          gama_i1: 27.
     0
                                                       demand i: 160.0
                                                                                      work load i: 160.0
                                                                                                                       work load gap_i: 0
                    duration time i: 4.0
121
                                                                       bow of i: 0 6
                                                                                                                            gama_i0: 27.0
          V id: 8
                              li: 6.0
                                                   xi: 3.6
                                                                                                  tail of i: 6.6
                                                                                                                                                        gama i1: 31.0
                    duration time i: 4.0
                                                        demand i: 160.0
                                                                                      work load i: 160.0
                                                                                                                       work load gap i: 0
122
          V_id: 9
                              1i: 7.0
                                                                       bow of i: 3.4
                                                                                                  tail of i: 10.4
                                                                                                                              gama_i0: 1.0
                                                                                                                                                          gama_i1: 2.0
                                                       demand i: 80.0
                    duration_time_i: 1.0
                                                                                      work load_i: 80.0
                                                                                                                       work load gap i: 0
          V_id: 10
123
                                 li: 3.0
                                                     xi: 2.6
                                                                         bow of i: 1.1
                                                                                                     tail of i: 4.1
                                                                                                                              gama_i0: 31.0
                                                                                                                                                          gama_i1: 35.
     0
                                                       demand_i: 140.0
                                                                                      work load i: 140.0
                                                                                                                       work load gap_i: 0
                    duration time i: 4.0
124
          V id: 11
                                li: 5.0
                                                     xi: 4.0
                                                                         bow of i: 1.5
                                                                                                     tail of i: 6.5
                                                                                                                              gama i0: 7.0
                                                                                                                                                          gama i1: 10.
     0
                    duration time i: 3.0
                                                       demand i: 140.0
                                                                                      work load i: 140.0
                                                                                                                       work load gap_i: 0
125
                                                     xi: 9.0
          V_id: 12
                                 li: 4.0
                                                                         bow of i: 7.0
                                                                                                     tail of i: 11.0
                                                                                                                                 gama_i0: 2.0
                                                                                                                                                             gama_i1: 4
     .0
                       duration_time_i: 2.0
                                                          demand_i: 80.0
                                                                                        work load_i: 80.0
                                                                                                                         work load gap_i: 0
                                                                                                                                gama_i0: 4.0
126
          V id: 13
                                                     xi: 9.0
                                                                                                     tail of i: 11.0
                                                                                                                                                             gama_i1: 7
                                 li: 4.0
                                                                         bow of i: 7.0
                                                                                                                         work load gap_i: 0
     .0
                       duration_time_i: 3.0
                                                          demand i: 120.0
                                                                                        work load_i: 120.0
                                                                                                                                 gama_i0: 7.0
127
          V id: 14
                                 li: 5.0
                                                     xi: 9.5
                                                                         bow of i: 7.0
                                                                                                     tail of i: 12.0
                                                                                                                                                             gama il:
     10.0
                         duration time i: 3.0
                                                             demand i: 140.0
                                                                                           work load i: 140.0
                                                                                                                            work load gap i: 0
          V_id: 15
128
                                li: 8.0
                                                     xi: 11.0
                                                                           bow of i: 7.0
                                                                                                       tail of i: 15.0
                                                                                                                                   gama_i0: 12.0
                                                                                                                                                               gama_i1
     : 16.0
                         duration_time_i: 4.0
                                                             demand_i: 160.0
                                                                                           work load_i: 160.0
                                                                                                                            work load gap_i: 0
129
                                                     xi: 8.5
                                                                         bow of i: 7.0
                                                                                                     tail of i: 10.0
                                                                                                                                 gama_i0: 28.0
           V_id: 16
                                 li: 3.0
                                                                                                                                                             gama_i1:
     32.0
                         duration time i: 4.0
                                                            demand i: 140.0
                                                                                           work load i: 140.0
                                                                                                                            work load gap i: 0
                                                                                                                                 gama i0: 16.0
130
                                 li: 5.0
                                                     xi: 9.5
                                                                         bow of it 7.0
                                                                                                     tail of i: 12.0
          V id: 17
                                                                                                                                                             gama i1:
     18.0
                         duration time i: 2.0
                                                             demand i: 100.0
                                                                                           work load i: 100.0
                                                                                                                            work load gap i: 0
131
    Algorithm finished and the total CPU time: 1229 s
132
133 End
134
```