```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=1186
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_19_3 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 = 57
       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
   Iteration begin:
34
35
   Beging the No. 0 iteration:
     obj[0] = 95.88 temp_best_value_gen = 95.88
36
     The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
     obj[gen-1] = 95.88 temp_best_value_gen = 95.88
40
     No, maintain solution and obj[gen] = 95.88, and the tolerance_counter = 1
41
42
     solution chromosome =
43
       first level: [ [ 6.54 6.39 4.03 2.99 8.17 4.68 3.39 5.58 3.8 4.97 2.96 3.87
44
    4.98 5.71 12. 13. 13. 12. 15.5
       second level: [ 2. 32. 7. 11. 1. 0. 13. 16. 20. 5. 25. 28. 30. 33. 3. 6. 9. 11.
45
46
   13.]
47
       third level: [3. 6. 2. 3. 6. 6. 3. 2. 2. 4. 2. 3. 6. 3. 2. 4. 3. 5. 2.]]
48
     The No. 1 iteration is finished!
49
50
   Beging the No. 2 iteration:
51
     obj[gen-1] = 95.88 temp best value gen = 92.66
52
     Yes, update solution and obj[gen] = 92.66
53
     solution chromosome =
54
       first level: [ [ 3.57 5.27 3.35 3.99 5.9 6.64 3.45 5.24 4.57 5.25 2.96 2.67
    5.69 5.91 2.64 14.5 6.13 13.5 13. ]
55
56
       second level: [13. 6. 8. 10. 1. 2. 4. 28. 17. 19. 23. 30. 26. 12. 33. 3. 0. 1.
57
58
       third level: [2. 3. 6. 4. 6. 2. 4. 6. 4. 2. 2. 2. 6. 6. 3. 2. 8. 4. 3.]]
59
     The No. 2 iteration is finished!
60
   Beging the No. 3 iteration:
61
     obj[gen-1] = 92.66 temp best value gen = 92.66
62
     No, maintain solution and obj[gen] = 92.66, and the tolerance_counter = 1
63
     solution chromosome =
64
       first level: [ [ 3.57 5.27 3.35 3.99 5.9 6.64 3.45 5.24 4.57 5.25 2.96 2.67
65
    5.69 5.91 2.64 14.5 6.13 13.5 13. ]
66
67
       second level: [13. 6. 8. 10. 1. 2. 4. 28. 17. 19. 23. 30. 26. 12. 33. 3. 0. 1.
68
69
       third level: [2. 3. 6. 4. 6. 2. 4. 6. 4. 2. 2. 2. 6. 6. 3. 2. 8. 4. 3.]]
     The No. 3 iteration is finished!
70
71
   Beging the No. 4 iteration:
73
     obj[gen-1] = 92.66 temp_best_value_gen = 92.66
74
     No, maintain solution and obj[gen] = 92.66, and the tolerance_counter = 2
75
     solution chromosome =
       first level: [ [ 3.57 5.27 3.35 3.99 5.9 6.64 3.45 5.24 4.57 5.25 2.96 2.67
76
    5.69 5.91 2.64 14.5 6.13 13.5 13. ]
77
       second level: [13. 6. 8. 10. 1. 2. 4. 28. 17. 19. 23. 30. 26. 12. 33. 3. 0. 1.
78
79
```

```
80
          third level: [2. 3. 6. 4. 6. 2. 4. 6. 4. 2. 2. 2. 6. 6. 3. 2. 8. 4. 3.]]
 81
        The No. 4 iteration is finished!
 82
 83
     Beging the No. 5 iteration:
        obj[gen-1] = 92.66 temp best value gen = 92.66
 84
 85
        No, maintain solution and obj[gen] = 92.66, and the tolerance counter = 3
 86
        solution chromosome =
          first level: [[ 3.57 5.27 3.35 3.99 5.9 6.64 3.45 5.24 4.57 5.25 2.96 2.67
 87
 88
      5.69 5.91 2.64 14.5 6.13 13.5 13. ]
          second\ level;\ [13.\ 6.\ 8.\ 10.\ 1.\ 2.\ 4.\ 28.\ 17.\ 19.\ 23.\ 30.\ 26.\ 12.\ 33.\ 3.\ 0.\ 1.
 89
 90
 91
          third level: [2. 3. 6. 4. 6. 2. 4. 6. 4. 2. 2. 2. 6. 6. 3. 2. 8. 4. 3.]]
 92
        The No. 5 iteration is finished!
 93
 94
     Beging the No. 6 iteration:
 95
        obj[gen-1] = 92.66 temp_best_value_gen = 92.66
        No, maintain solution and obj[\overline{gen}] = \overline{92.66}, and the tolerance_counter = 4
 96
 97
        solution chromosome =
 98
          first level: [ [ 3.57 5.27 3.35 3.99 5.9 6.64 3.45 5.24 4.57 5.25 2.96 2.67
 99
      5.69 5.91 2.64 14.5 6.13 13.5 13. ]
100
          second level: [13. 6. 8. 10. 1. 2. 4. 28. 17. 19. 23. 30. 26. 12. 33. 3. 0. 1.
101
          third level: [2. 3. 6. 4. 6. 2. 4. 6. 4. 2. 2. 2. 6. 6. 3. 2. 8. 4. 3.]]
102
103
        The No. 6 iteration is finished!
104
105
106
107
    The iteration is terminated and then visulize the solution:
108
        solution chromosome =
109
          first level: [ [ 3.57 5.27 3.35 3.99 5.9 6.64 3.45 5.24 4.57 5.25 2.96 2.67
110
      5.69 5.91 2.64 14.5 6.13 13.5 13. ]
          second\ level;\ [13.\ 6.\ 8.\ 10.\ 1.\ 2.\ 4.\ 28.\ 17.\ 19.\ 23.\ 30.\ 26.\ 12.\ 33.\ 3.\ 0.\ 1.
111
112
          third level: [2. 3. 6. 4. 6. 2. 4. 6. 4. 2. 2. 2. 6. 6. 3. 2. 8. 4. 3.]]
113
114
        Objective function values and some other indicators:
                                                           Obj0 + Obj1 = 314.63
115
          Obi0 = 34.00
                                 Obj1 = 280.63
116
          Total movement of crane: 38.63
117
          Total waiting time in berth position: 242.00
118
          Total index of q during berthing: 452.00
119
        Specific arrangement for each vessel:
                              1i: 7.0
                                                                                                                             gama_i0: 13.0
120
          V_id: 0
                                                                        bow of i: 0.1
                                                                                                    tail of i: 7.1
                                                                                                                                                          gama_i1: 17.0
                                                        demand i: 160.0
                                                                                       work load i: 160.0
                                                                                                                         work load gap_i: 0
                    duration time i: 4.0
121
          V id: 1
                                                    xi: 5.3
                              1i: 6.0
                                                                        bow of i: 2.3
                                                                                                    tail of i: 8.3
                                                                                                                              gama i0: 6.0
                                                                                                                                                          gama_i1: 8.0
                     duration_time_i: 2.0
                                                        demand i: 80.0
                                                                                       work load i: 80.0
                                                                                                                         work load gap_i: 0
122
           V_id: 2
                               li: 6.0
                                                   xi: 3.3
                                                                        bow of i: 0.3
                                                                                                    tail of i: 6.3
                                                                                                                             gama_i0: 8.0
                                                                                                                                                          gama_i1: 10.0
                     duration_time_i: 2.0
                                                        demand\_i{:}\ 160.0
                                                                                       work load i: 160.0
                                                                                                                         work load gap_i: 0
                                                   xi: 4.0
123
          V_id: 3
                              li: 4.0
                                                                        bow of i: 2.0
                                                                                                    tail of i: 6.0
                                                                                                                              gama_i0: 10.0
                                                                                                                                                          gama_i1: 12.0
                     duration_time_i: 2.0
                                                        demand_i: 120.0
                                                                                       work load_i: 120.0
                                                                                                                         work load gap_i: 0
124
          V_id: 4
                              1i: 9.0
                                                   xi: 59
                                                                        bow of i: 1.4
                                                                                                    tail of i: 10.4
                                                                                                                                gama i0: 1.0
                                                                                                                                                            gama i1: 2.0
                                                                                                                         work load gap_i: 0
                     duration_time_i: 1.0
                                                        demand i: 80.0
                                                                                       work load i: 80.0
125
          V id: 5
                               li: 6.0
                                                    xi: 6.6
                                                                        bow of i: 3.6
                                                                                                    tail of i: 9.6
                                                                                                                              gama i0: 2.0
                                                                                                                                                          gama i1: 4.0
                                                        demand_i: 80.0
                    duration_time_i: 2.0
                                                                                       work load_i: 80.0
                                                                                                                         work load gap_i: 0
126
                                                                        bow of i: 1.4
          V id: 6
                              li: 4.0
                                                   xi: 3.4
                                                                                                    tail of i: 5.4
                                                                                                                              gama i0: 4.0
                                                                                                                                                          gama i1: 6.0
                     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: 2.2
                                                                                                    tail of i: 8.2
                                                                                                                             gama_i0: 28.0
                                                                                                                                                          gama_i1: 30.0
                               li: 6.0
                                                   xi: 5.2
                     duration time i: 2.0
                                                        demand i: 160.0
                                                                                       work load i: 160.0
                                                                                                                         work load gap i: 0
128
          V id: 8
                              li: 5.0
                                                   xi: 4.6
                                                                        bow of i: 2.1
                                                                                                    tail of i: 7.1
                                                                                                                              gama i0: 17.0
                                                                                                                                                          gama i1: 19.0
                     duration_time_i: 2.0
                                                        demand_i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                         work load gap_i: 0
129
           V_id: 9
                               li: 7.0
                                                   xi: 5.3
                                                                        bow of i: 1.8
                                                                                                    tail of i: 8.8
                                                                                                                             gama_i0: 19.0
                                                                                                                                                          gama_i1: 23.0
                    duration_time_i: 4.0
                                                        demand_i: 160.0
                                                                                       work load_i: 160.0
                                                                                                                         work load gap_i: 0
                                                      xi: 3.0
                                                                                                                                gama_i0: 23.0
130
           V id: 10
                                 li: 3.0
                                                                          bow of i: 1.5
                                                                                                      tail of i: 4.5
                                                                                                                                                             gama_i1: 26.
     0
                                                        demand i: 120.0
                                                                                       work load_i: 120.0
                                                                                                                         work load gap_i: 0
                    duration time i: 3.0
131
                                                      xi: 2.7
                                                                                                      tail of i: 4.7
           V id: 11
                                 li: 4.0
                                                                          bow of i: 0.7
                                                                                                                                gama i0: 30.0
                                                                                                                                                            gama i1: 33.
     0
                                                        demand_i: 100.0
                                                                                                                         work load gap_i: 0
                    duration time i: 3.0
                                                                                       work load i: 100.0
                                                      xi: 5.7
132
           V_id: 12
                                 li: 7.0
                                                                          bow of i: 2.2
                                                                                                      tail of i: 9.2
                                                                                                                                gama_i0: 26.0
                                                                                                                                                             gama_i1: 28.
     0
                                                        demand_i: 160.0
                     duration_time_i: 2.0
                                                                                       work load_i: 160.0
                                                                                                                         work load gap_i: 0
133
           V id: 13
                                                      xi: 5.9
                                                                          bow of i: 1.9
                                 li: 8.0
                                                                                                      tail of i: 9.9
                                                                                                                                gama i0: 12.0
                                                                                                                                                            gama i1: 13.
     0
                    duration_time_i: 1.0
                                                        demand i: 120.0
                                                                                       work load i: 120.0
                                                                                                                         work load gap_i: 0
                                                      xi: 2.6
134
           V id: 14
                                 1i: 3.0
                                                                          bow of i: 1.1
                                                                                                      tail of i: 4.1
                                                                                                                                gama i0: 33.0
                                                                                                                                                             gama_i1: 35.
     0
                                                        demand_i: 120.0
                    duration_time_i: 2.0
                                                                                       work load_i: 120.0
                                                                                                                         work load gap_i: 0
135
                                                                                                                                     gama_i0: 3.0
           V_id: 15
                                                                             bow of i: 10.5
                                                                                                         tail of i: 18.5
                                 li: 8.0
                                                                                                                                                                 gama_i1
                                                      xi: 14.5
                                                             demand_i: 100.0
                                                                                            work load_i: 100.0
                                                                                                                              work load gap_i: 0
     : 6.0
                          duration_time_i: 3.0
136
           V_id: 16
                                                                                                      tail of i: 10.1
                                                                                                                                   gama_i0: 0.0
                                 li: 8.0
                                                      xi: 6.1
                                                                          bow of i: 2.1
                                                                                                                                                               gama_i1: 1
                                                           demand i: 80.0
                                                                                          work load i: 80.0
                                                                                                                           work load gap i: 0
     .0
                       duration time i: 1.0
                                                                             bow of i: 10.5
137
          V_id: 17
                                                                                                         tail of i: 16.5
                                                                                                                                     gama i0: 1.0
                                 1i: 6.0
                                                      xi: 13.5
                                                                                                                                                                  gama il
     : 3.0
                          duration time i: 2.0
                                                              demand i: 120.0
                                                                                            work load i: 120.0
                                                                                                                              work load gap i: 0
138
           V_id: 18
                                 li: 5.0
                                                                             bow of i: 10.5
                                                                                                         tail of i: 15.5
                                                                                                                                     gama_i0: 6.0
                                                                                                                                                                  gama_i1
                                                                                                                              work load gap_i: 0
                                                                                            work load_i: 160.0
     : 9.0
                          duration_time_i: 3.0
                                                             demand i: 160.0
139
140
     Algorithm finished and the total CPU time: 1328 s
141
     End
142
```