```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=50960
 2
 3
     import sys; print('Python %s on %s' % (sys.version, sys.platform))
     sys.path.extend([E:\\] ===\\\\3 ====\\\\1 =====\\\1 =====\\\1 =====\\\1 =====\\\1 =====\\\1 =====\\\1 =====\\\1 ====\\\1 =====\\\1 ====\\\1 ====\\\1 ====\\\1 ====\\\1 ===\\\1 ===\\\1 ==\\\1 ===\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 ==\\\1 =\\\1 ==\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 =\\\1 
      01_My_Python_Code'])
 5
 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_17_3 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 = 51
             Iter_num_GA = 300
24
25
             Select_rate = 0.85
26
             Crossover rate = 0.95
27
             Mutation rate = 0.95
28
             Mu_oper_type = 1
29
             vessel\_move\_way = 2
30
             coefficient for Obj1= 1.9
             coefficient for Obj2= 0.100000000000000009
31
32
33
      Iteration begin:
34
35
     Beging the No. 0 iteration:
         obj[0] = 69.90 temp_best_value_gen = 69.90
36
         The No. 0 iteration is finished!
37
38
39 Beging the No. 1 iteration:
         obj[gen-1] = 69.90 temp_best_value_gen = 69.90
40
         No, maintain solution and obj[gen] = 69.90, and the tolerance_counter = 1
41
42
         solution chromosome =
43
             first level: [ [ 4.5 11. 15.5 21.5 26.5 26.5 3. 2.5 2. 4.5 3. 4.5 2. 2.
44
       1.5 4.5 4.5]
45
             second level: [5. 4. 2. 1. 5. 9. 3. 6. 1. 8. 10. 12. 15. 17. 19. 22. 23.]
46
             third level: [8. 4. 3. 2. 2. 7. 4. 5. 4. 5. 5. 2. 2. 3. 3. 6. 4.]]
47
         The No. 1 iteration is finished!
48
     Beging the No. 2 iteration:
49
50
         obj[gen-1] = 69.90 temp_best_value_gen = 69.90
51
         No, maintain solution and obj[gen] = 69.90, and the tolerance_counter = 2
52
         solution chromosome =
53
             first level: [ [ 4.5 11. 15.5 21.5 26.5 26.5 3. 2.5 2. 4.5 3. 4.5 2. 2.
       1.5 4.5 4.5]
54
55
             second level: [5, 4, 2, 1, 5, 9, 3, 6, 1, 8, 10, 12, 15, 17, 19, 22, 23,]
             third level: [8. 4. 3. 2. 2. 7. 4. 5. 4. 5. 5. 2. 2. 3. 3. 6. 4.]]
56
57
         The No. 2 iteration is finished!
58
59
     Beging the No. 3 iteration:
         obj[gen-1] = 69.90 temp_best_value_gen = 69.90
60
         No, maintain solution and obj[gen] = 69.90, and the tolerance_counter = 3
61
62
         solution chromosome =
63
             first level: [ [ 4.5 11. 15.5 21.5 26.5 26.5 3. 2.5 2. 4.5 3. 4.5 2. 2.
       1.5 4.5 4.5]
64
             second level: [5. 4. 2. 1. 5. 9. 3. 6. 1. 8. 10. 12. 15. 17. 19. 22. 23.]
65
             third level: [8. 4. 3. 2. 2. 7. 4. 5. 4. 5. 5. 2. 2. 3. 3. 6. 4.]]
66
67
         The No. 3 iteration is finished!
68
69 Beging the No. 4 iteration:
         obj[gen-1] = 69.90 temp_best_value_gen = 69.90
70
71
         No, maintain solution and obj[gen] = 69.90, and the tolerance_counter = 4
         solution chromosome =
73
             first level: [ [ 4.5 11. 15.5 21.5 26.5 26.5 3. 2.5 2. 4.5 3. 4.5 2. 2.
74
75
             second level: [5. 4. 2. 1. 5. 9. 3. 6. 1. 8. 10. 12. 15. 17. 19. 22. 23.]
             third level: [8. 4. 3. 2. 2. 7. 4. 5. 4. 5. 5. 2. 2. 3. 3. 6. 4.]]
76
         The No. 4 iteration is finished!
77
78
     Beging the No. 5 iteration:
79
```

```
obj[gen-1] = 69.90 temp_best_value_gen = 69.90
       No, maintain solution and obj[gen] = \overline{69.90}, and the tolerance_counter = 5
 81
       solution chromosome =
 82
 83
          first level: [ [ 4.5 11. 15.5 21.5 26.5 26.5 3. 2.5 2. 4.5 3. 4.5 2. 2.
 84
       1.5 4.5 4.51
 85
          second level: [5. 4. 2. 1. 5. 9. 3. 6. 1. 8. 10. 12. 15. 17. 19. 22. 23.]
          third level: [8. 4. 3. 2. 2. 7. 4. 5. 4. 5. 5. 2. 2. 3. 3. 6. 4.]]
 86
 87
       The No. 5 iteration is finished!
 88
 89
     Beging the No. 6 iteration:
       obj[gen-1] = 69.90 temp_best_value_gen = 69.90
 90
 91
        No, maintain solution and obj[gen] = 69.90, and the tolerance_counter = 6
 92
       solution chromosome =
 93
          first level: [ [ 4.5 11. 15.5 21.5 26.5 26.5 3. 2.5 2. 4.5 3. 4.5 2. 2.
 94
      1.5 4.5 4.5]
 95
          second level: [5. 4. 2. 1. 5. 9. 3. 6. 1. 8. 10. 12. 15. 17. 19. 22. 23.]
 96
          third level: [8. 4. 3. 2. 2. 7. 4. 5. 4. 5. 5. 2. 2. 3. 3. 6. 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: [ [ 4.5 11. 15.5 21.5 26.5 26.5 3. 2.5 2. 4.5 3. 4.5 2. 2.
103
104
      1.5 4.5 4.5]
105
          second level: [5. 4. 2. 1. 5. 9. 3. 6. 1. 8. 10. 12. 15. 17. 19. 22. 23.]
          third level: [8. 4. 3. 2. 2. 7. 4. 5. 4. 5. 5. 2. 2. 3. 3. 6. 4.]]
106
107
        Objective function values and some other indicators:
                                 Obj1 = 262.00
                                                          Obj0 + Obj1 = 285.00
108
          Obi0 = 23.00
109
          Total movement of crane: 100.00
110
          Total waiting time in berth position: 162.00
111
          Total index of q during berthing: 659.00
112
        Specific arrangement for each vessel:
113
          V_id: 0
                              li: 9.0
                                                  xi: 4.5
                                                                       bow of i: 0.0
                                                                                                   tail of i: 9.0
                                                                                                                            gama_i0: 5.0
                                                                                                                                                        gama_i1: 6.0
                    duration_time_i: 1.0
                                                        demand i: 140.0
                                                                                      work load i: 140.0
                                                                                                                       work load gap i: 0
                                                                         bow of i: 9.0
114
          V_id: 1
                              li: 4.0
                                                   xi: 11.0
                                                                                                     tail of i: 13.0
                                                                                                                                 gama_i0: 4.0
                                                                                                                                                             gama_i1: 6
     .0
                       duration_time_i: 2.0
                                                          demand i: 100.0
                                                                                         work load i: 100.0
                                                                                                                          work load gap_i: 0
115
          V id: 2
                              li: 5.0
                                                  xi: 15.5
                                                                         bow of i: 13.0
                                                                                                     tail of i: 18.0
                                                                                                                                 gama i0: 2.0
                                                                                                                                                             gama i1:5
                       duration_time_i: 3.0
     .0
                                                          demand_i: 140.0
                                                                                         work load_i: 140.0
                                                                                                                         work load gap_i: 0
116
          V_id: 3
                              li: 7.0
                                                   xi: 21.5
                                                                         bow of i: 18.0
                                                                                                     tail of i: 25.0
                                                                                                                                 gama_i0: 1.0
                                                                                                                                                             gama_i1: 5
                                                                                                                          work load gap_i: 0
     .0
                       duration_time_i: 4.0
                                                          demand_i: 140.0
                                                                                         work load_i: 140.0
117
          V id: 4
                                                                         bow of i: 25.0
                                                                                                                                 gama_i0: 5.0
                              li: 3.0
                                                  xi: 26.5
                                                                                                     tail of i: 28.0
                                                                                                                                                             gama i1:9
                                                                                                                          work load gap_i: 0
     .0
                       duration_time_i: 4.0
                                                          demand i: 140.0
                                                                                         work load i: 140.0
118
          V_id: 5
                              li: 7.0
                                                   xi: 26.5
                                                                         bow of i: 23.0
                                                                                                     tail of i: 30.0
                                                                                                                                 gama_i0: 9.0
                                                                                                                                                             gama i1:
     10.0
                         duration_time_i: 1.0
                                                            demand_i: 140.0
                                                                                           work load_i: 140.0
                                                                                                                            work load gap_i: 0
119
          V_id: 6
                                                                                                                            gama_i0: 3.0
                              li: 6.0
                                                  xi: 3.0
                                                                       bow of i: 0.0
                                                                                                   tail of i: 6.0
                                                                                                                                                        gama_i1: 5.0
                    duration_time_i: 2.0
                                                        demand_i: 140.0
                                                                                      work load_i: 140.0
                                                                                                                       work load gap_i: 0
                                                                       bow of i: 0.0
120
          V_id: 7
                              li: 5.0
                                                   xi: 2.5
                                                                                                   tail of i: 5.0
                                                                                                                            gama_i0: 6.0
                                                                                                                                                        gama_i1: 8.0
                                                        demand i: 160.0
                                                                                                                       work load gap_i: 0
                    duration time i: 2.0
                                                                                      work load i: 160.0
121
                                                                                                                            gama_i0: 1.0
          V id: 8
                              li: 4.0
                                                   xi: 2.0
                                                                       bow of i: 0.0
                                                                                                   tail of i: 4.0
                                                                                                                                                        gama_i1: 3.0
                    duration time i: 2.0
                                                        demand i: 120.0
                                                                                      work load i: 120.0
                                                                                                                       work load gap i: 0
122
          V_id: 9
                              li: 9.0
                                                   xi: 4.5
                                                                       bow of i: 0.0
                                                                                                   tail of i: 9.0
                                                                                                                            gama_i0: 8.0
                                                                                                                                                        gama_i1: 10.0
                                                       demand i: 120.0
                    duration_time_i: 2.0
                                                                                      work load i: 120.0
                                                                                                                       work load gap_i: 0
123
          V_id: 10
                                 li: 6.0
                                                     xi: 3.0
                                                                         bow of i: 0.0
                                                                                                     tail of i: 6.0
                                                                                                                              gama_i0: 10.0
                                                                                                                                                           gama_i1: 12.
     0
                                                        demand_i: 140.0
                                                                                      work load i: 140.0
                                                                                                                       work load gap_i: 0
                    duration_time_i: 2.0
124
          V id: 11
                                 1i: 9.0
                                                     xi: 4.5
                                                                         bow of i: 0.0
                                                                                                     tail of i: 9.0
                                                                                                                              gama i0: 12.0
                                                                                                                                                          gama i1: 15.
     0
                    duration_time_i: 3.0
                                                       demand i: 120.0
                                                                                      work load_i: 120.0
                                                                                                                       work load gap_i: 0
125
                                                     xi: 2.0
                                                                         bow of i: 0.0
          V_id: 12
                                 li: 4.0
                                                                                                     tail of i: 4.0
                                                                                                                              gama_i0: 15.0
                                                                                                                                                           gama_i1: 17.
     0
                    duration_time_i: 2.0
                                                        demand_i: 80.0
                                                                                      work load_i: 80.0
                                                                                                                       work load gap_i: 0
          V_id: 13
                                                                         bow of i: 0.0
                                                                                                                              gama_i0: 17.0
126
                                li: 4.0
                                                     xi: 2.0
                                                                                                     tail of i: 4.0
                                                                                                                                                           gama_i1: 19.
                                                       demand_i: 120.0
     0
                    duration_time_i: 2.0
                                                                                      work load i: 120.0
                                                                                                                       work load gap_i: 0
                                                                                                                                                          gama_i1: 22.
127
          V id: 14
                                                     xi: 1.5
                                                                         bow of i: 0.0
                                                                                                     tail of i: 3.0
                                                                                                                              gama i0: 19.0
                                 li: 3.0
     0
                    duration time i: 3.0
                                                       demand i: 160.0
                                                                                      work load i: 160.0
                                                                                                                       work load gap i: 0
128
          V_id: 15
                                li: 9.0
                                                                         bow of i: 0.0
                                                                                                     tail of i: 9.0
                                                                                                                              gama_i0: 22.0
                                                     xi: 4.5
                                                                                                                                                           gama i1: 23.
     0
                    duration_time_i: 1.0
                                                       demand_i: 60.0
                                                                                      work load_i: 60.0
                                                                                                                       work load gap_i: 0
129
                                 li: 9.0
                                                                         bow of i: 0.0
                                                                                                     tail of i: 9.0
                                                                                                                              gama_i0: 23.0
                                                     xi: 4.5
                                                                                                                                                           gama_i1: 24.
     0
                    duration time i: 1.0
                                                       demand i: 80.0
                                                                                      work load i: 80.0
                                                                                                                       work load gap_i: 0
130
131
     Algorithm finished and the total CPU time: 1633 s
132
133
```