```
"E:\1 □□□□\3 □□□□□\1 □□□□□□\1 □□□□□□□\1_□□□□□□_□□□□\1_LW_□□□□2\6 □□□□\2 python code\01_My_Python_Code\Scripts\python.exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=57964

import sys; print('Python %s on %s' % (sys.version, sys.platform))
sys.path.extend(['E:\\1 □□□□\\3 □□□□□\\1 □□□□□□□\\1 □□□□□□□□□\\1_□□□□□□_□□□□\\1_LW_□□□□2\\6 □□□□\\2 python code\\01_My_Python_Code', 'E:/1 □□□□/3 □□□□□/1 □□□□□□□/1 □□□□□□□□□/1_□□□□□□_□□□□/1_LW_□□□□2/6 □□□□/2 python code/01_My_Python_Code'])

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
>>> runfile('E:/1 □□□□/3 □□□□□/1 □□□□□□□/1 □□□□□□□□□/1_□□□□□□_□□□□/1_LW_□□□□2/6 □□□□/2 python code/01_My_Python_Code/main_BACASP_official_ENSGA-II.py', wdir='E:/1 □□□□/3 □□□□□/1 □□□□□□□/1 □□□□□□□□□/1_□□□□□□_□□□□/1_LW_□□□□2/6 □□□□/2 python code/01_My_Python_Code')
Backend TkAgg is interactive backend. Turning interactive mode on.
Waiting 1s.....

This is the  R_11_8 _standerd_test.xlsx  optimization process solved by ENSGA-II algorithm.

Start

Before iteration:
    Read basic data
    Parameter setting:
        trail =  58
        Pop_size =  30
        Tolerance_iteration_unchanged_number =  10
        Chrom_size =  33
        Iter_num_GA =  300
        Select_rate =  0.85
        Crossover_rate =  0.95
        Mutation rate =  0.95
        Mu_oper_type =  1
        vessel_move_way =  2
        coefficient for Obj1=  1.9
        coefficient for Obj2=  0.10000000000000009
        gen =  0

Iteration begin:
Beging the No. 0  iteration:
    obj[0] = 37.60      temp_best_value_gen = 37.60
    The No. 0  iteration is finished!

Beging the No. 1  iteration:
    obj[gen-1] = 37.60   temp_best_value_gen = 37.60
    No, maintain solution  and obj[gen] = 37.60 , and the tolerance_counter = 1
    solution chromosome =
        first level: [ [ 3.5  9.5 14.5 20.  26.   2.   1.5  4.   4.5  4.   3.5]
        second level:  [ 2.  0.  7.  5.  1.  3.  1.  6.  8. 10. 12.]
        third level:  [6. 2. 5. 6. 5. 2. 3. 2. 5. 3. 2.] ]
    The No. 1  iteration is finished!

Beging the No. 2  iteration:
    obj[gen-1] = 37.60   temp_best_value_gen = 37.60
    No, maintain solution  and obj[gen] = 37.60 , and the tolerance_counter = 2
    solution chromosome =
        first level: [ [ 3.5  9.5 14.5 20.  26.   2.   1.5  4.   4.5  4.   3.5]
        second level:  [ 2.  0.  7.  5.  1.  3.  1.  6.  8. 10. 12.]
        third level:  [6. 2. 5. 6. 5. 2. 3. 2. 5. 3. 2.] ]
    The No. 2  iteration is finished!

Beging the No. 3  iteration:
    obj[gen-1] = 37.60   temp_best_value_gen = 37.60
    No, maintain solution  and obj[gen] = 37.60 , and the tolerance_counter = 3
    solution chromosome =
        first level: [ [ 3.5  9.5 14.5 20.  26.   2.   1.5  4.   4.5  4.   3.5]
        second level:  [ 2.  0.  7.  5.  1.  3.  1.  6.  8. 10. 12.]
        third level:  [6. 2. 5. 6. 5. 2. 3. 2. 5. 3. 2.] ]
    The No. 3  iteration is finished!

Beging the No. 4  iteration:
    obj[gen-1] = 37.60   temp_best_value_gen = 37.60
    No, maintain solution  and obj[gen] = 37.60 , and the tolerance_counter = 4
    solution chromosome =
        first level: [ [ 3.5  9.5 14.5 20.  26.   2.   1.5  4.   4.5  4.   3.5]
        second level:  [ 2.  0.  7.  5.  1.  3.  1.  6.  8. 10. 12.]
        third level:  [6. 2. 5. 6. 5. 2. 3. 2. 5. 3. 2.] ]
    The No. 4  iteration is finished!

Beging the No. 5  iteration:
    obj[gen-1] = 37.60   temp_best_value_gen = 37.60
    No, maintain solution  and obj[gen] = 37.60 , and the tolerance_counter = 5
    solution chromosome =
        first level: [ [ 3.5  9.5 14.5 20.  26.   2.   1.5  4.   4.5  4.   3.5]
```

```
 80        second level:  [ 2.  0.  7.  5.  1.  3.  1.  6.  8. 10. 12.]
 81        third level:  [6. 2. 5. 6. 5. 2. 3. 2. 5. 3. 2.] ]
 82     The No. 5  iteration is finished!
 83
 84  Beging the No. 6  iteration:
 85     obj[gen-1] = 37.60   temp_best_value_gen = 37.60
 86     No, maintain solution  and obj[gen] = 37.60 , and the tolerance_counter = 6
 87     solution chromosome =
 88        first level: [ [ 3.5  9.5 14.5 20.  26.   2.   1.5  4.   4.5  4.   3.5]
 89        second level:  [ 2.  0.  7.  5.  1.  3.  1.  6.  8. 10. 12.]
 90        third level:  [6. 2. 5. 6. 5. 2. 3. 2. 5. 3. 2.] ]
 91     The No. 6  iteration is finished!
 92
 93  Beging the No. 7  iteration:
 94     obj[gen-1] = 37.60   temp_best_value_gen = 37.60
 95     No, maintain solution  and obj[gen] = 37.60 , and the tolerance_counter = 7
 96     solution chromosome =
 97        first level: [ [ 3.5  9.5 14.5 20.  26.   2.   1.5  4.   4.5  4.   3.5]
 98        second level:  [ 2.  0.  7.  5.  1.  3.  1.  6.  8. 10. 12.]
 99        third level:  [6. 2. 5. 6. 5. 2. 3. 2. 5. 3. 2.] ]
100     The No. 7  iteration is finished!
101
102  Beging the No. 8  iteration:
103     obj[gen-1] = 37.60   temp_best_value_gen = 37.60
104     No, maintain solution  and obj[gen] = 37.60 , and the tolerance_counter = 8
105     solution chromosome =
106        first level: [ [ 3.5  9.5 14.5 20.  26.   2.   1.5  4.   4.5  4.   3.5]
107        second level:  [ 2.  0.  7.  5.  1.  3.  1.  6.  8. 10. 12.]
108        third level:  [6. 2. 5. 6. 5. 2. 3. 2. 5. 3. 2.] ]
109     The No. 8  iteration is finished!
110
111  Beging the No. 9  iteration:
112     obj[gen-1] = 37.60   temp_best_value_gen = 37.60
113     No, maintain solution  and obj[gen] = 37.60 , and the tolerance_counter = 9
114     solution chromosome =
115        first level: [ [ 3.5  9.5 14.5 20.  26.   2.   1.5  4.   4.5  4.   3.5]
116        second level:  [ 2.  0.  7.  5.  1.  3.  1.  6.  8. 10. 12.]
117        third level:  [6. 2. 5. 6. 5. 2. 3. 2. 5. 3. 2.] ]
118     The No. 9  iteration is finished!
119
120  Beging the No. 10  iteration:
121     obj[gen-1] = 37.60   temp_best_value_gen = 37.60
122     No, maintain solution  and obj[gen] = 37.60 , and the tolerance_counter = 10
123     solution chromosome =
124        first level: [ [ 3.5  9.5 14.5 20.  26.   2.   1.5  4.   4.5  4.   3.5]
125        second level:  [ 2.  0.  7.  5.  1.  3.  1.  6.  8. 10. 12.]
126        third level:  [6. 2. 5. 6. 5. 2. 3. 2. 5. 3. 2.] ]
127     The No. 10  iteration is finished!
128
129
130  ------------------------------------------------------------------------------
131  The iteration is terminated and then visulize the solution:
132     solution chromosome =
133        first level: [ [ 3.5  9.5 14.5 20.  26.   2.   1.5  4.   4.5  4.   3.5]
134        second level:  [ 2.  0.  7.  5.  1.  3.  1.  6.  8. 10. 12.]
135        third level:  [6. 2. 5. 6. 5. 2. 3. 2. 5. 3. 2.] ]
136     Objective function values and some other indicators:
137        Obj0 = 15.00          Obj1 = 91.00          Obj0 + Obj1 = 106.00
138        Total movement of crane: 24.00
139        Total waiting time in berth position: 55.00
140        Total index of q during berthing: 343.00
141     Specific arrangement for each vessel:
142        V_id:  0          li: 7.0          xi: 3.5          bow of i: 0.0          tail of i: 7.0          gama_i0: 2.0          gama_i1: 3.0
                  duration_time_i: 1.0          demand_i: 80.0          work load_i: 80.0          work load gap_i: 0
143        V_id:  1          li: 5.0          xi: 9.5          bow of i: 7.0          tail of i: 12.0          gama_i0: 0.0          gama_i1: 2.0
                  duration_time_i: 2.0          demand_i: 60.0          work load_i: 60.0          work load gap_i: 0
144        V_id:  2          li: 5.0          xi: 14.5          bow of i: 12.0          tail of i: 17.0          gama_i0: 7.0          gama_i1: 9
    .0          duration_time_i: 2.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
145        V_id:  3          li: 6.0          xi: 20.0          bow of i: 17.0          tail of i: 23.0          gama_i0: 5.0          gama_i1: 6
    .0          duration_time_i: 1.0          demand_i: 100.0          work load_i: 100.0          work load gap_i: 0
146        V_id:  4          li: 8.0          xi: 26.0          bow of i: 22.0          tail of i: 30.0          gama_i0: 1.0          gama_i1: 2
    .0          duration_time_i: 1.0          demand_i: 80.0          work load_i: 80.0          work load gap_i: 0
147        V_id:  5          li: 4.0          xi: 2.0          bow of i: 0.0          tail of i: 4.0          gama_i0: 3.0          gama_i1: 6.0
                  duration_time_i: 3.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
148        V_id:  6          li: 3.0          xi: 1.5          bow of i: 0.0          tail of i: 3.0          gama_i0: 1.0          gama_i1: 2.0
                  duration_time_i: 1.0          demand_i: 60.0          work load_i: 60.0          work load gap_i: 0
149        V_id:  7          li: 8.0          xi: 4.0          bow of i: 0.0          tail of i: 8.0          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
150        V_id:  8          li: 9.0          xi: 4.5          bow of i: 0.0          tail of i: 9.0          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
151        V_id:  9          li: 8.0          xi: 4.0          bow of i: 0.0          tail of i: 8.0          gama_i0: 10.0          gama_i1: 12.0
                  duration_time_i: 2.0          demand_i: 100.0          work load_i: 100.0          work load gap_i: 0
152        V_id:  10          li: 7.0          xi: 3.5          bow of i: 0.0          tail of i: 7.0          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
```

```
153
154  Algorithm finished and the total CPU time: 1249 s
155  End
156
```