```
"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=27889

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_9_7 _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 =  27
        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] = 15.50      temp_best_value_gen = 15.50
    The No. 0  iteration is finished!

Beging the No. 1  iteration:
    obj[gen-1] = 15.50   temp_best_value_gen = 15.50
    No, maintain solution  and obj[gen] = 15.50 , and the tolerance_counter = 1
    solution chromosome =
        first level: [ [ 3.   9.  15.  19.5 22.5 25.5  4.   2.5  2.5]
        second level:  [3. 2. 2. 1. 0. 3. 4. 1. 6.]
        third level:  [6. 5. 3. 2. 2. 2. 4. 5. 4.] ]
    The No. 1  iteration is finished!

Beging the No. 2  iteration:
    obj[gen-1] = 15.50   temp_best_value_gen = 15.50
    No, maintain solution  and obj[gen] = 15.50 , and the tolerance_counter = 2
    solution chromosome =
        first level: [ [ 3.   9.  15.  19.5 22.5 25.5  4.   2.5  2.5]
        second level:  [3. 2. 2. 1. 0. 3. 4. 1. 6.]
        third level:  [6. 5. 3. 2. 2. 2. 4. 5. 4.] ]
    The No. 2  iteration is finished!

Beging the No. 3  iteration:
    obj[gen-1] = 15.50   temp_best_value_gen = 15.50
    No, maintain solution  and obj[gen] = 15.50 , and the tolerance_counter = 3
    solution chromosome =
        first level: [ [ 3.   9.  15.  19.5 22.5 25.5  4.   2.5  2.5]
        second level:  [3. 2. 2. 1. 0. 3. 4. 1. 6.]
        third level:  [6. 5. 3. 2. 2. 2. 4. 5. 4.] ]
    The No. 3  iteration is finished!

Beging the No. 4  iteration:
    obj[gen-1] = 15.50   temp_best_value_gen = 15.50
    No, maintain solution  and obj[gen] = 15.50 , and the tolerance_counter = 4
    solution chromosome =
        first level: [ [ 3.   9.  15.  19.5 22.5 25.5  4.   2.5  2.5]
        second level:  [3. 2. 2. 1. 0. 3. 4. 1. 6.]
        third level:  [6. 5. 3. 2. 2. 2. 4. 5. 4.] ]
    The No. 4  iteration is finished!

Beging the No. 5  iteration:
    obj[gen-1] = 15.50   temp_best_value_gen = 15.50
    No, maintain solution  and obj[gen] = 15.50 , and the tolerance_counter = 5
    solution chromosome =
        first level: [ [ 3.   9.  15.  19.5 22.5 25.5  4.   2.5  2.5]
```

```
      second level:  [3. 2. 2. 1. 0. 3. 4. 1. 6.]
      third level:  [6. 5. 3. 2. 2. 2. 4. 5. 4.] ]
   The No. 5  iteration is finished!

Beging the No. 6  iteration:
   obj[gen-1] = 15.50   temp_best_value_gen = 15.50
   No, maintain solution  and obj[gen] = 15.50 , and the tolerance_counter = 6
   solution chromosome =
      first level: [ [ 3.   9.  15.  19.5 22.5 25.5  4.   2.5  2.5]
      second level:  [3. 2. 2. 1. 0. 3. 4. 1. 6.]
      third level:  [6. 5. 3. 2. 2. 2. 4. 5. 4.] ]
   The No. 6  iteration is finished!

Beging the No. 7  iteration:
   obj[gen-1] = 15.50   temp_best_value_gen = 15.50
   No, maintain solution  and obj[gen] = 15.50 , and the tolerance_counter = 7
   solution chromosome =
      first level: [ [ 3.   9.  15.  19.5 22.5 25.5  4.   2.5  2.5]
      second level:  [3. 2. 2. 1. 0. 3. 4. 1. 6.]
      third level:  [6. 5. 3. 2. 2. 2. 4. 5. 4.] ]
   The No. 7  iteration is finished!

Beging the No. 8  iteration:
   obj[gen-1] = 15.50   temp_best_value_gen = 15.30
   Yes, update solution and obj[gen] = 15.30
   solution chromosome =
      first level: [ [ 3.   3.  15.  19.5 22.5 25.5  4.   2.5  9. ]
      second level:  [3. 6. 2. 1. 0. 3. 4. 1. 2.]
      third level:  [6. 4. 3. 2. 2. 2. 4. 5. 5.] ]
   The No. 8  iteration is finished!

Beging the No. 9  iteration:
   obj[gen-1] = 15.30   temp_best_value_gen = 15.30
   No, maintain solution  and obj[gen] = 15.30 , and the tolerance_counter = 1
   solution chromosome =
      first level: [ [ 3.   3.  15.  19.5 22.5 25.5  4.   2.5  9. ]
      second level:  [3. 6. 2. 1. 0. 3. 4. 1. 2.]
      third level:  [6. 4. 3. 2. 2. 2. 4. 5. 5.] ]
   The No. 9  iteration is finished!

Beging the No. 10  iteration:
   obj[gen-1] = 15.30   temp_best_value_gen = 14.70
   Yes, update solution and obj[gen] = 14.70
   solution chromosome =
      first level: [ [ 3.   3.   9.  19.5 22.5 25.5  4.   2.5 15. ]
      second level:  [3. 6. 2. 1. 0. 3. 4. 1. 2.]
      third level:  [6. 4. 5. 2. 2. 2. 4. 5. 3.] ]
   The No. 10  iteration is finished!

Beging the No. 11  iteration:
   obj[gen-1] = 14.70   temp_best_value_gen = 14.70
   No, maintain solution  and obj[gen] = 14.70 , and the tolerance_counter = 1
   solution chromosome =
      first level: [ [ 3.   3.   9.  19.5 22.5 25.5  4.   2.5 15. ]
      second level:  [3. 6. 2. 1. 0. 3. 4. 1. 2.]
      third level:  [6. 4. 5. 2. 2. 2. 4. 5. 3.] ]
   The No. 11  iteration is finished!

Beging the No. 12  iteration:
   obj[gen-1] = 14.70   temp_best_value_gen = 14.70
   No, maintain solution  and obj[gen] = 14.70 , and the tolerance_counter = 2
   solution chromosome =
      first level: [ [ 3.   3.   9.  19.5 22.5 25.5  4.   2.5 15. ]
      second level:  [3. 6. 2. 1. 0. 3. 4. 1. 2.]
      third level:  [6. 4. 5. 2. 2. 2. 4. 5. 3.] ]
   The No. 12  iteration is finished!


--------------------------------------------------------------------------------
The iteration is terminated and then visulize the solution:
   solution chromosome =
      first level: [ [ 3.   3.   9.  19.5 22.5 25.5  4.   2.5 15. ]
      second level:  [3. 6. 2. 1. 0. 3. 4. 1. 2.]
      third level:  [6. 4. 5. 2. 2. 2. 4. 5. 3.] ]
   Objective function values and some other indicators:
      Obj0 = 6.00          Obj1 = 33.00          Obj0 + Obj1 = 39.00
      Total movement of crane: 11.00
      Total waiting time in berth position: 22.00
      Total index of q during berthing: 533.00
   Specific arrangement for each vessel:
      V_id:  0          li: 6.0          xi: 3.0          bow of i: 0.0          tail of i: 6.0          gama_i0: 3.0          gama_i1: 4.0
                duration_time_i: 1.0          demand_i: 60.0          work load_i: 60.0          work load gap_i: 0
      V_id:  1          li: 6.0          xi: 3.0          bow of i: 0.0          tail of i: 6.0          gama_i0: 6.0          gama_i1: 7.0
                duration_time_i: 1.0          demand_i: 80.0          work load_i: 80.0          work load gap_i: 0
```

V_id: 2 li: 6.0 xi: 9.0 bow of i: 6.0 tail of i: 12.0 gama_i0: 2.0 gama_i1: 3.0 duration_time_i: 1.0 demand_i: 100.0 work load_i: 100.0 work load gap_i: 0

V_id: 3 li: 3.0 xi: 19.5 bow of i: 18.0 tail of i: 21.0 gama_i0: 1.0 gama_i1: 4.0 duration_time_i: 3.0 demand_i: 120.0 work load_i: 120.0 work load gap_i: 0

V_id: 4 li: 3.0 xi: 22.5 bow of i: 21.0 tail of i: 24.0 gama_i0: 0.0 gama_i1: 3.0 duration_time_i: 3.0 demand_i: 120.0 work load_i: 120.0 work load gap_i: 0

V_id: 5 li: 9.0 xi: 25.5 bow of i: 21.0 tail of i: 30.0 gama_i0: 3.0 gama_i1: 7.0 duration_time_i: 4.0 demand_i: 140.0 work load_i: 140.0 work load gap_i: 0

V_id: 6 li: 8.0 xi: 4.0 bow of i: 0.0 tail of i: 8.0 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

V_id: 7 li: 5.0 xi: 2.5 bow of i: 0.0 tail of i: 5.0 gama_i0: 1.0 gama_i1: 3.0 duration_time_i: 2.0 demand_i: 120.0 work load_i: 120.0 work load gap_i: 0

V_id: 8 li: 5.0 xi: 15.0 bow of i: 12.5 tail of i: 17.5 gama_i0: 2.0 gama_i1: 4.0 duration_time_i: 2.0 demand_i: 120.0 work load_i: 120.0 work load gap_i: 0

Algorithm finished and the total CPU time: 1230 s

End