```
"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=56495

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_6 _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] = 23.00      temp_best_value_gen = 23.00
    The No. 0  iteration is finished!

Beging the No. 1  iteration:
    obj[gen-1] = 23.00   temp_best_value_gen = 23.00
    No, maintain solution  and obj[gen] = 23.00 , and the tolerance_counter = 1
    solution chromosome =
        first level: [ [ 3.  10.5 17.  21.5 26.5 25.5  3.   1.5  4. ]
        second level:  [0. 1. 5. 6. 1. 5. 1. 6. 3.]
        third level:  [5. 3. 2. 4. 2. 7. 6. 2. 5.] ]
    The No. 1  iteration is finished!

Beging the No. 2  iteration:
    obj[gen-1] = 23.00   temp_best_value_gen = 19.80
    Yes, update solution and obj[gen] = 19.80
    solution chromosome =
        first level: [ [ 3.  10.5 17.  21.5 25.5 25.5  3.   1.5  4. ]
        second level:  [0. 1. 5. 6. 5. 1. 1. 6. 3.]
        third level:  [5. 3. 2. 4. 5. 2. 6. 2. 5.] ]
    The No. 2  iteration is finished!

Beging the No. 3  iteration:
    obj[gen-1] = 19.80   temp_best_value_gen = 19.80
    No, maintain solution  and obj[gen] = 19.80 , and the tolerance_counter = 1
    solution chromosome =
        first level: [ [ 3.  10.5 17.  21.5 25.5 25.5  3.   1.5  4. ]
        second level:  [0. 1. 5. 6. 5. 1. 1. 6. 3.]
        third level:  [5. 3. 2. 4. 5. 2. 6. 2. 5.] ]
    The No. 3  iteration is finished!

Beging the No. 4  iteration:
    obj[gen-1] = 19.80   temp_best_value_gen = 19.80
    No, maintain solution  and obj[gen] = 19.80 , and the tolerance_counter = 2
    solution chromosome =
        first level: [ [ 3.  10.5 17.  21.5 25.5 25.5  3.   1.5  4. ]
        second level:  [0. 1. 5. 6. 5. 1. 1. 6. 3.]
        third level:  [5. 3. 2. 4. 5. 2. 6. 2. 5.] ]
    The No. 4  iteration is finished!

Beging the No. 5  iteration:
    obj[gen-1] = 19.80   temp_best_value_gen = 19.80
    No, maintain solution  and obj[gen] = 19.80 , and the tolerance_counter = 3
    solution chromosome =
        first level: [ [ 3.  10.5 17.  21.5 25.5 25.5  3.   1.5  4. ]
```

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

Beging the No. 6  iteration:
    obj[gen-1] = 19.80   temp_best_value_gen = 19.80
    No, maintain solution  and obj[gen] = 19.80 , and the tolerance_counter = 4
    solution chromosome =
        first level: [ [ 3.  10.5 17.  21.5 25.5 25.5  3.   1.5  4. ]
        second level:  [0. 1. 5. 6. 5. 1. 1. 6. 3.]
        third level:  [5. 3. 2. 4. 5. 2. 6. 2. 5.] ]
    The No. 6  iteration is finished!

Beging the No. 7  iteration:
    obj[gen-1] = 19.80   temp_best_value_gen = 19.80
    No, maintain solution  and obj[gen] = 19.80 , and the tolerance_counter = 5
    solution chromosome =
        first level: [ [ 3.  10.5 17.  21.5 25.5 25.5  3.   1.5  4. ]
        second level:  [0. 1. 5. 6. 5. 1. 1. 6. 3.]
        third level:  [5. 3. 2. 4. 5. 2. 6. 2. 5.] ]
    The No. 7  iteration is finished!

Beging the No. 8  iteration:
    obj[gen-1] = 19.80   temp_best_value_gen = 19.80
    No, maintain solution  and obj[gen] = 19.80 , and the tolerance_counter = 6
    solution chromosome =
        first level: [ [ 3.  10.5 17.  21.5 25.5 25.5  3.   1.5  4. ]
        second level:  [0. 1. 5. 6. 5. 1. 1. 6. 3.]
        third level:  [5. 3. 2. 4. 5. 2. 6. 2. 5.] ]
    The No. 8  iteration is finished!

Beging the No. 9  iteration:
    obj[gen-1] = 19.80   temp_best_value_gen = 19.80
    No, maintain solution  and obj[gen] = 19.80 , and the tolerance_counter = 7
    solution chromosome =
        first level: [ [ 3.  10.5 17.  21.5 25.5 25.5  3.   1.5  4. ]
        second level:  [0. 1. 5. 6. 5. 1. 1. 6. 3.]
        third level:  [5. 3. 2. 4. 5. 2. 6. 2. 5.] ]
    The No. 9  iteration is finished!

Beging the No. 10  iteration:
    obj[gen-1] = 19.80   temp_best_value_gen = 19.80
    No, maintain solution  and obj[gen] = 19.80 , and the tolerance_counter = 8
    solution chromosome =
        first level: [ [ 3.  10.5 17.  21.5 25.5 25.5  3.   1.5  4. ]
        second level:  [0. 1. 5. 6. 5. 1. 1. 6. 3.]
        third level:  [5. 3. 2. 4. 5. 2. 6. 2. 5.] ]
    The No. 10  iteration is finished!

Beging the No. 11  iteration:
    obj[gen-1] = 19.80   temp_best_value_gen = 19.80
    No, maintain solution  and obj[gen] = 19.80 , and the tolerance_counter = 9
    solution chromosome =
        first level: [ [ 3.  10.5 17.  21.5 25.5 25.5  3.   1.5  4. ]
        second level:  [0. 1. 5. 6. 5. 1. 1. 6. 3.]
        third level:  [5. 3. 2. 4. 5. 2. 6. 2. 5.] ]
    The No. 11  iteration is finished!

Beging the No. 12  iteration:
    obj[gen-1] = 19.80   temp_best_value_gen = 19.80
    No, maintain solution  and obj[gen] = 19.80 , and the tolerance_counter = 10
    solution chromosome =
        first level: [ [ 3.  10.5 17.  21.5 25.5 25.5  3.   1.5  4. ]
        second level:  [0. 1. 5. 6. 5. 1. 1. 6. 3.]
        third level:  [5. 3. 2. 4. 5. 2. 6. 2. 5.] ]
    The No. 12  iteration is finished!


--------------------------------------------------------------------------------
The iteration is terminated and then visulize the solution:
    solution chromosome =
        first level: [ [ 3.  10.5 17.  21.5 25.5 25.5  3.   1.5  4. ]
        second level:  [0. 1. 5. 6. 5. 1. 1. 6. 3.]
        third level:  [5. 3. 2. 4. 5. 2. 6. 2. 5.] ]
    Objective function values and some other indicators:
        Obj0 = 8.00             Obj1 = 46.00            Obj0 + Obj1 = 54.00
        Total movement of crane: 18.00
        Total waiting time in berth position: 28.00
        Total index of q during berthing: 486.00
    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: 0.0            gama_i1: 1.0
                    duration_time_i: 1.0            demand_i: 100.0         work load_i: 100.0      work load gap_i: 0
        V_id:  1            li: 9.0             xi: 10.5            bow of i: 6.0           tail of i: 15.0         gama_i0: 1.0            gama_i1: 3
    .0              duration_time_i: 2.0            demand_i: 80.0          work load_i: 80.0       work load gap_i: 0
```

```
V_id: 2 li: 4.0 xi: 17.0 bow of i: 15.0 tail of i: 19.0 gama_i0: 5.0 gama_i1: 9.0 duration_time_i: 4.0 demand_i: 140.0 work load_i: 140.0 work load gap_i: 0
V_id: 3 li: 5.0 xi: 21.5 bow of i: 19.0 tail of i: 24.0 gama_i0: 6.0 gama_i1: 8.0 duration_time_i: 2.0 demand_i: 120.0 work load_i: 120.0 work load gap_i: 0
V_id: 4 li: 5.0 xi: 25.5 bow of i: 23.0 tail of i: 28.0 gama_i0: 5.0 gama_i1: 6.0 duration_time_i: 1.0 demand_i: 60.0 work load_i: 60.0 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: 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: 6 li: 6.0 xi: 3.0 bow of i: 0.0 tail of i: 6.0 gama_i0: 1.0 gama_i1: 3.0 duration_time_i: 2.0 demand_i: 140.0 work load_i: 140.0 work load gap_i: 0
V_id: 7 li: 3.0 xi: 1.5 bow of i: 0.0 tail of i: 3.0 gama_i0: 6.0 gama_i1: 9.0 duration_time_i: 3.0 demand_i: 120.0 work load_i: 120.0 work load gap_i: 0
V_id: 8 li: 8.0 xi: 4.0 bow of i: 0.0 tail of i: 8.0 gama_i0: 3.0 gama_i1: 5.0 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: 1263 s
End
```