```
"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=7835

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_2_1 _standerd_test.xlsx  optimization process solved by ENSGA-II algorithm.

Start

Before iteration:
    Read basic data
    Parameter setting:
        trail =  27
        Pop_size =  10
        Tolerance_iteration_unchanged_number =  10
        Chrom_size =  6
        Iter_num_GA =  300
        Select_rate =  0.95
        Crossover_rate =  0.75
        Mutation rate =  0.9
        Mu_oper_type =  1
        vessel_move_way =  2
        coefficient for Obj1=  1.5
        coefficient for Obj2=  0.5
        gen =  0

Iteration begin:
Beging the No. 0  iteration:
    obj[0] = 10.50      temp_best_value_gen = 10.50
    The No. 0  iteration is finished!

Beging the No. 1  iteration:
    obj[gen-1] = 10.50   temp_best_value_gen = 9.50
    Yes, update solution and obj[gen] = 9.50
    solution chromosome =
        first level: [ [2. 8.]
        second level:  [1. 3.]
        third level:  [4. 2.] ]
    The No. 1  iteration is finished!

Beging the No. 2  iteration:
    obj[gen-1] = 9.50     temp_best_value_gen = 9.50
    No, maintain solution  and obj[gen] = 9.50 , and the tolerance_counter = 1
    solution chromosome =
        first level: [ [2. 8.]
        second level:  [1. 3.]
        third level:  [4. 2.] ]
    The No. 2  iteration is finished!

Beging the No. 3  iteration:
    obj[gen-1] = 9.50     temp_best_value_gen = 9.50
    No, maintain solution  and obj[gen] = 9.50 , and the tolerance_counter = 2
    solution chromosome =
        first level: [ [2. 8.]
        second level:  [1. 3.]
        third level:  [4. 2.] ]
    The No. 3  iteration is finished!

Beging the No. 4  iteration:
    obj[gen-1] = 9.50     temp_best_value_gen = 5.50
    Yes, update solution and obj[gen] = 5.50
    solution chromosome =
        first level: [ [2. 8.]
        second level:  [1. 1.]
        third level:  [4. 2.] ]
    The No. 4  iteration is finished!

Beging the No. 5  iteration:
    obj[gen-1] = 5.50     temp_best_value_gen = 5.50
    No, maintain solution  and obj[gen] = 5.50 , and the tolerance_counter = 1
    solution chromosome =
        first level: [ [2. 8.]
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      second level:  [1. 1.]
      third level:  [4. 2.] ]
   The No. 5  iteration is finished!

Beging the No. 6  iteration:
   obj[gen-1] = 5.50     temp_best_value_gen = 5.50
   No, maintain solution  and obj[gen] = 5.50 , and the tolerance_counter = 2
   solution chromosome =
      first level: [ [2. 8.]
      second level:  [1. 1.]
      third level:  [4. 2.] ]
   The No. 6  iteration is finished!

Beging the No. 7  iteration:
   obj[gen-1] = 5.50     temp_best_value_gen = 5.50
   No, maintain solution  and obj[gen] = 5.50 , and the tolerance_counter = 3
   solution chromosome =
      first level: [ [2. 8.]
      second level:  [1. 1.]
      third level:  [4. 2.] ]
   The No. 7  iteration is finished!

Beging the No. 8  iteration:
   obj[gen-1] = 5.50     temp_best_value_gen = 5.50
   No, maintain solution  and obj[gen] = 5.50 , and the tolerance_counter = 4
   solution chromosome =
      first level: [ [2. 8.]
      second level:  [1. 1.]
      third level:  [4. 2.] ]
   The No. 8  iteration is finished!

Beging the No. 9  iteration:
   obj[gen-1] = 5.50     temp_best_value_gen = 5.50
   No, maintain solution  and obj[gen] = 5.50 , and the tolerance_counter = 5
   solution chromosome =
      first level: [ [2. 8.]
      second level:  [1. 1.]
      third level:  [4. 2.] ]
   The No. 9  iteration is finished!

Beging the No. 10  iteration:
   obj[gen-1] = 5.50     temp_best_value_gen = 5.50
   No, maintain solution  and obj[gen] = 5.50 , and the tolerance_counter = 6
   solution chromosome =
      first level: [ [2. 8.]
      second level:  [1. 1.]
      third level:  [4. 2.] ]
   The No. 10  iteration is finished!

Beging the No. 11  iteration:
   obj[gen-1] = 5.50     temp_best_value_gen = 5.50
   No, maintain solution  and obj[gen] = 5.50 , and the tolerance_counter = 7
   solution chromosome =
      first level: [ [2. 8.]
      second level:  [1. 1.]
      third level:  [4. 2.] ]
   The No. 11  iteration is finished!

Beging the No. 12  iteration:
   obj[gen-1] = 5.50     temp_best_value_gen = 5.50
   No, maintain solution  and obj[gen] = 5.50 , and the tolerance_counter = 8
   solution chromosome =
      first level: [ [2. 8.]
      second level:  [1. 1.]
      third level:  [4. 2.] ]
   The No. 12  iteration is finished!

Beging the No. 13  iteration:
   obj[gen-1] = 5.50     temp_best_value_gen = 5.50
   No, maintain solution  and obj[gen] = 5.50 , and the tolerance_counter = 9
   solution chromosome =
      first level: [ [2. 8.]
      second level:  [1. 1.]
      third level:  [4. 2.] ]
   The No. 13  iteration is finished!

Beging the No. 14  iteration:
   obj[gen-1] = 5.50     temp_best_value_gen = 5.50
   No, maintain solution  and obj[gen] = 5.50 , and the tolerance_counter = 10
   solution chromosome =
      first level: [ [2. 8.]
      second level:  [1. 1.]
      third level:  [4. 2.] ]
   The No. 14  iteration is finished!
```

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164
165
166 ----------------------------------------------------------------------------------------
167 The iteration is terminated and then visulize the solution:
168     solution chromosome =
169         first level: [ [2. 8.]
170         second level:  [1. 1.]
171         third level:  [4. 2.] ]
172     Objective function values and some other indicators:
173         Obj0 = 3.00             Obj1 = 2.00             Obj0 + Obj1 = 5.00
174         Total movement of crane: 0.00
175         Total waiting time in berth position: 2.00
176         Total index of q during berthing: 39.00
177     Specific arrangement for each vessel:
178         V_id:  0            li: 4.0             xi: 2.0             bow of i: 0.0             tail of i: 4.0             gama_i0: 1.0             gama_i1: 3.0
                    duration_time_i: 2.0            demand_i: 160.0         work load_i: 160.0          work load gap_i: 0
179         V_id:  1            li: 8.0             xi: 8.0             bow of i: 4.0             tail of i: 12.0            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
180
181 Algorithm finished and the total CPU time: 118 s
182 End
183
```