```
1  "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=12612
2
3  import sys; print('Python %s on %s' % (sys.version, sys.platform))
4  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'])
5
6  PyDev console: starting.
7
8  Python 3.9.7 (tags/v3.9.7:1016ef3, Aug 30 2021, 20:19:38) [MSC v.1929 64 bit (AMD64)] on win32
9  >>> 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')
10 Backend TkAgg is interactive backend. Turning interactive mode on.
11 Waiting 1s.....
12
13 This is the  R_2_1 _standerd_test.xlsx  optimization process solved by ENSGA-II algorithm.
14
15 Start
16
17 Before iteration:
18    Read basic data
19    Parameter setting:
20        trail =  34
21        Pop_size =  20
22        Tolerance_iteration_unchanged_number =  10
23        Chrom_size =  6
24        Iter_num_GA =  300
25        Select_rate =  0.85
26        Crossover_rate =  0.95
27        Mutation rate =  0.8
28        Mu_oper_type =  1
29        vessel_move_way =  1
30        coefficient for Obj1=  1.5
31        coefficient for Obj2=  0.5
32        gen =  0
33
34  Iteration begin:
35  Beging the No. 0  iteration:
36     obj[0] = 5.50    temp_best_value_gen = 5.50
37     The No. 0  iteration is finished!
38
39  Beging the No. 1  iteration:
40     obj[gen-1] = 5.50    temp_best_value_gen = 5.50
41     No, maintain solution  and obj[gen] = 5.50 , and the tolerance_counter = 1
42     solution chromosome =
43        first level: [ [2. 8.]
44        second level:  [2. 0.]
45        third level:  [4. 7.] ]
46     The No. 1  iteration is finished!
47
48  Beging the No. 2  iteration:
49     obj[gen-1] = 5.50    temp_best_value_gen = 5.50
50     No, maintain solution  and obj[gen] = 5.50 , and the tolerance_counter = 2
51     solution chromosome =
52        first level: [ [2. 8.]
53        second level:  [2. 0.]
54        third level:  [4. 7.] ]
55     The No. 2  iteration is finished!
56
57  Beging the No. 3  iteration:
58     obj[gen-1] = 5.50    temp_best_value_gen = 5.50
59     No, maintain solution  and obj[gen] = 5.50 , and the tolerance_counter = 3
60     solution chromosome =
61        first level: [ [2. 8.]
62        second level:  [2. 0.]
63        third level:  [4. 7.] ]
64     The No. 3  iteration is finished!
65
66  Beging the No. 4  iteration:
67     obj[gen-1] = 5.50    temp_best_value_gen = 4.50
68     Yes, update solution and obj[gen] = 4.50
69     solution chromosome =
70        first level: [ [2. 8.]
71        second level:  [0. 0.]
72        third level:  [2. 7.] ]
73     The No. 4  iteration is finished!
74
75  Beging the No. 5  iteration:
76     obj[gen-1] = 4.50    temp_best_value_gen = 4.50
77     No, maintain solution  and obj[gen] = 4.50 , and the tolerance_counter = 1
78     solution chromosome =
79        first level: [ [2. 8.]
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 80        second level:  [0. 0.]
 81        third level:  [2. 7.] ]
 82     The No. 5  iteration is finished!
 83
 84   Beging the No. 6  iteration:
 85      obj[gen-1] = 4.50    temp_best_value_gen = 4.50
 86      No, maintain solution  and obj[gen] = 4.50 , and the tolerance_counter = 2
 87      solution chromosome =
 88        first level: [ [2. 8.]
 89        second level:  [0. 0.]
 90        third level:  [2. 7.] ]
 91     The No. 6  iteration is finished!
 92
 93   Beging the No. 7  iteration:
 94      obj[gen-1] = 4.50    temp_best_value_gen = 4.50
 95      No, maintain solution  and obj[gen] = 4.50 , and the tolerance_counter = 3
 96      solution chromosome =
 97        first level: [ [2. 8.]
 98        second level:  [0. 0.]
 99        third level:  [2. 7.] ]
100     The No. 7  iteration is finished!
101
102   Beging the No. 8  iteration:
103      obj[gen-1] = 4.50    temp_best_value_gen = 4.50
104      No, maintain solution  and obj[gen] = 4.50 , and the tolerance_counter = 4
105      solution chromosome =
106        first level: [ [2. 8.]
107        second level:  [0. 0.]
108        third level:  [2. 7.] ]
109     The No. 8  iteration is finished!
110
111   Beging the No. 9  iteration:
112      obj[gen-1] = 4.50    temp_best_value_gen = 4.50
113      No, maintain solution  and obj[gen] = 4.50 , and the tolerance_counter = 5
114      solution chromosome =
115        first level: [ [2. 8.]
116        second level:  [0. 0.]
117        third level:  [2. 7.] ]
118     The No. 9  iteration is finished!
119
120   Beging the No. 10  iteration:
121      obj[gen-1] = 4.50    temp_best_value_gen = 4.50
122      No, maintain solution  and obj[gen] = 4.50 , and the tolerance_counter = 6
123      solution chromosome =
124        first level: [ [2. 8.]
125        second level:  [0. 0.]
126        third level:  [2. 7.] ]
127     The No. 10  iteration is finished!
128
129   Beging the No. 11  iteration:
130      obj[gen-1] = 4.50    temp_best_value_gen = 4.50
131      No, maintain solution  and obj[gen] = 4.50 , and the tolerance_counter = 7
132      solution chromosome =
133        first level: [ [2. 8.]
134        second level:  [0. 0.]
135        third level:  [2. 7.] ]
136     The No. 11  iteration is finished!
137
138   Beging the No. 12  iteration:
139      obj[gen-1] = 4.50    temp_best_value_gen = 4.50
140      No, maintain solution  and obj[gen] = 4.50 , and the tolerance_counter = 8
141      solution chromosome =
142        first level: [ [2. 8.]
143        second level:  [0. 0.]
144        third level:  [2. 7.] ]
145     The No. 12  iteration is finished!
146
147   Beging the No. 13  iteration:
148      obj[gen-1] = 4.50    temp_best_value_gen = 4.50
149      No, maintain solution  and obj[gen] = 4.50 , and the tolerance_counter = 9
150      solution chromosome =
151        first level: [ [2. 8.]
152        second level:  [0. 0.]
153        third level:  [2. 7.] ]
154     The No. 13  iteration is finished!
155
156   Beging the No. 14  iteration:
157      obj[gen-1] = 4.50    temp_best_value_gen = 4.50
158      No, maintain solution  and obj[gen] = 4.50 , and the tolerance_counter = 10
159      solution chromosome =
160        first level: [ [2. 8.]
161        second level:  [0. 0.]
162        third level:  [2. 7.] ]
163     The No. 14  iteration is finished!
```

```
164
165
166  ----------------------------------------------------------------------------
167  The iteration is terminated and then visulize the solution:
168      solution chromosome =
169          first level: [ [2. 8.]
170          second level:  [0. 0.]
171          third level:  [2. 7.] ]
172      Objective function values and some other indicators:
173          Obj0 = 3.00              Obj1 = 0.00            Obj0 + Obj1 = 3.00
174          Total movement of crane: 0.00
175          Total waiting time in berth position: 0.00
176          Total index of q during berthing: 43.00
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: 0.0          gama_i1: 4.0
                   duration_time_i: 4.0        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: 0.0          gama_i1: 1.0
                   duration_time_i: 1.0        demand_i: 120.0      work load_i: 120.0      work load gap_i: 0
180
181  Algorithm finished and the total CPU time: 265 s
182  End
183
```