```
 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=3967
 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 =  56
21        Pop_size =  20
22        Tolerance_iteration_unchanged_number =  10
23        Chrom_size =  6
24        Iter_num_GA =  300
25        Select_rate =  0.75
26        Crossover_rate =  0.85
27        Mutation rate =  0.85
28        Mu_oper_type =  2
29        vessel_move_way =  1
30        coefficient for Obj1=  0.5
31        coefficient for Obj2=  1.5
32        gen =  0
33
34  Iteration begin:
35  Beging the No. 0  iteration:
36     obj[0] = 14.21     temp_best_value_gen = 14.21
37     The No. 0  iteration is finished!
38
39  Beging the No. 1  iteration:
40     obj[gen-1] = 14.21   temp_best_value_gen = 11.20
41     Yes, update solution and obj[gen] = 11.20
42     solution chromosome =
43        first level: [ [2.05 4.09]
44        second level:  [2. 0.]
45        third level:  [3. 7.] ]
46     The No. 1  iteration is finished!
47
48  Beging the No. 2  iteration:
49     obj[gen-1] = 11.20   temp_best_value_gen = 11.20
50     No, maintain solution  and obj[gen] = 11.20 , and the tolerance_counter = 1
51     solution chromosome =
52        first level: [ [2.05 4.09]
53        second level:  [2. 0.]
54        third level:  [3. 7.] ]
55     The No. 2  iteration is finished!
56
57  Beging the No. 3  iteration:
58     obj[gen-1] = 11.20   temp_best_value_gen = 11.20
59     No, maintain solution  and obj[gen] = 11.20 , and the tolerance_counter = 2
60     solution chromosome =
61        first level: [ [2.05 4.09]
62        second level:  [2. 0.]
63        third level:  [3. 7.] ]
64     The No. 3  iteration is finished!
65
66  Beging the No. 4  iteration:
67     obj[gen-1] = 11.20   temp_best_value_gen = 8.93
68     Yes, update solution and obj[gen] = 8.93
69     solution chromosome =
70        first level: [ [2.17 4.01]
71        second level:  [3. 0.]
72        third level:  [2. 4.] ]
73     The No. 4  iteration is finished!
74
75  Beging the No. 5  iteration:
76     obj[gen-1] = 8.93    temp_best_value_gen = 7.84
77     Yes, update solution and obj[gen] = 7.84
78     solution chromosome =
79        first level: [ [2.33 4.01]
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 80        second level:  [2. 0.]
 81        third level:  [2. 7.] ]
 82     The No. 5  iteration is finished!
 83
 84   Beging the No. 6  iteration:
 85      obj[gen-1] = 7.84    temp_best_value_gen = 7.22
 86      Yes, update solution and obj[gen] = 7.22
 87      solution chromosome =
 88        first level: [ [2.22 4.01]
 89        second level:  [2. 0.]
 90        third level:  [2. 4.] ]
 91     The No. 6  iteration is finished!
 92
 93   Beging the No. 7  iteration:
 94      obj[gen-1] = 7.22    temp_best_value_gen = 7.22
 95      No, maintain solution  and obj[gen] = 7.22 , and the tolerance_counter = 1
 96      solution chromosome =
 97        first level: [ [2.22 4.01]
 98        second level:  [2. 0.]
 99        third level:  [2. 4.] ]
100     The No. 7  iteration is finished!
101
102   Beging the No. 8  iteration:
103      obj[gen-1] = 7.22    temp_best_value_gen = 6.76
104      Yes, update solution and obj[gen] = 6.76
105      solution chromosome =
106        first level: [ [2.49 4.01]
107        second level:  [1. 0.]
108        third level:  [2. 7.] ]
109     The No. 8  iteration is finished!
110
111   Beging the No. 9  iteration:
112      obj[gen-1] = 6.76    temp_best_value_gen = 6.76
113      No, maintain solution  and obj[gen] = 6.76 , and the tolerance_counter = 1
114      solution chromosome =
115        first level: [ [2.49 4.01]
116        second level:  [1. 0.]
117        third level:  [2. 7.] ]
118     The No. 9  iteration is finished!
119
120   Beging the No. 10  iteration:
121      obj[gen-1] = 6.76    temp_best_value_gen = 6.76
122      No, maintain solution  and obj[gen] = 6.76 , and the tolerance_counter = 2
123      solution chromosome =
124        first level: [ [2.49 4.01]
125        second level:  [1. 0.]
126        third level:  [2. 7.] ]
127     The No. 10  iteration is finished!
128
129   Beging the No. 11  iteration:
130      obj[gen-1] = 6.76    temp_best_value_gen = 6.76
131      No, maintain solution  and obj[gen] = 6.76 , and the tolerance_counter = 3
132      solution chromosome =
133        first level: [ [2.49 4.01]
134        second level:  [1. 0.]
135        third level:  [2. 7.] ]
136     The No. 11  iteration is finished!
137
138   Beging the No. 12  iteration:
139      obj[gen-1] = 6.76    temp_best_value_gen = 6.76
140      No, maintain solution  and obj[gen] = 6.76 , and the tolerance_counter = 4
141      solution chromosome =
142        first level: [ [2.49 4.01]
143        second level:  [1. 0.]
144        third level:  [2. 7.] ]
145     The No. 12  iteration is finished!
146
147   Beging the No. 13  iteration:
148      obj[gen-1] = 6.76    temp_best_value_gen = 6.76
149      No, maintain solution  and obj[gen] = 6.76 , and the tolerance_counter = 5
150      solution chromosome =
151        first level: [ [2.49 4.01]
152        second level:  [1. 0.]
153        third level:  [2. 7.] ]
154     The No. 13  iteration is finished!
155
156   Beging the No. 14  iteration:
157      obj[gen-1] = 6.76    temp_best_value_gen = 6.76
158      No, maintain solution  and obj[gen] = 6.76 , and the tolerance_counter = 6
159      solution chromosome =
160        first level: [ [2.49 4.01]
161        second level:  [1. 0.]
162        third level:  [2. 7.] ]
163     The No. 14  iteration is finished!
```

```
164
165  Beging the No. 15  iteration:
166     obj[gen-1] = 6.76    temp_best_value_gen = 6.76
167     No, maintain solution  and obj[gen] = 6.76 , and the tolerance_counter = 7
168     solution chromosome =
169        first level: [ [2.49 4.01]
170        second level:  [1. 0.]
171        third level:  [2. 7.] ]
172     The No. 15  iteration is finished!
173
174  Beging the No. 16  iteration:
175     obj[gen-1] = 6.76    temp_best_value_gen = 6.76
176     No, maintain solution  and obj[gen] = 6.76 , and the tolerance_counter = 8
177     solution chromosome =
178        first level: [ [2.49 4.01]
179        second level:  [1. 0.]
180        third level:  [2. 7.] ]
181     The No. 16  iteration is finished!
182
183  Beging the No. 17  iteration:
184     obj[gen-1] = 6.76    temp_best_value_gen = 6.76
185     No, maintain solution  and obj[gen] = 6.76 , and the tolerance_counter = 9
186     solution chromosome =
187        first level: [ [2.49 4.01]
188        second level:  [1. 0.]
189        third level:  [2. 7.] ]
190     The No. 17  iteration is finished!
191
192  Beging the No. 18  iteration:
193     obj[gen-1] = 6.76    temp_best_value_gen = 6.76
194     No, maintain solution  and obj[gen] = 6.76 , and the tolerance_counter = 10
195     solution chromosome =
196        first level: [ [2.49 4.01]
197        second level:  [1. 0.]
198        third level:  [2. 7.] ]
199     The No. 18  iteration is finished!
200
201
202  -----------------------------------------------------------------------------------------
203  The iteration is terminated and then visulize the solution:
204     solution chromosome =
205        first level: [ [2.49 4.01]
206        second level:  [1. 0.]
207        third level:  [2. 7.] ]
208     Objective function values and some other indicators:
209     Obj0 = 4.00          Obj1 = 3.17          Obj0 + Obj1 = 7.17
210     Total movement of crane: 2.17
211     Total waiting time in berth position: 1.00
212     Total index of q during berthing: 19.00
213     Specific arrangement for each vessel:
214     V_id:  0          li: 4.0          xi: 2.5          bow of i: 0.5          tail of i: 4.5          gama_i0: 1.0          gama_i1: 5.0
                duration_time_i: 4.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
215     V_id:  1          li: 8.0          xi: 4.0          bow of i: 0.0          tail of i: 8.0          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
216
217  Algorithm finished and the total CPU time: 318 s
218  End
219
```