```
 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=3897
 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 =  40
21          Pop_size =  10
22          Tolerance_iteration_unchanged_number =  8
23          Chrom_size =  6
24          Iter_num_GA =  300
25          Select_rate =  0.9
26          Crossover_rate =  0.95
27          Mutation rate =  0.9
28          Mu_oper_type =  1
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] = 22.50      temp_best_value_gen = 22.50
37      The No. 0  iteration is finished!
38
39  Beging the No. 1  iteration:
40      obj[gen-1] = 22.50   temp_best_value_gen = 20.50
41      Yes, update solution and obj[gen] = 20.50
42      solution chromosome =
43          first level: [ [2. 8.]
44          second level:  [7. 4.]
45          third level:  [4. 5.] ]
46      The No. 1  iteration is finished!
47
48  Beging the No. 2  iteration:
49      obj[gen-1] = 20.50   temp_best_value_gen = 11.50
50      Yes, update solution and obj[gen] = 11.50
51      solution chromosome =
52          first level: [ [8. 4.]
53          second level:  [4. 2.]
54          third level:  [4. 4.] ]
55      The No. 2  iteration is finished!
56
57  Beging the No. 3  iteration:
58      obj[gen-1] = 11.50   temp_best_value_gen = 8.50
59      Yes, update solution and obj[gen] = 8.50
60      solution chromosome =
61          first level: [ [2. 8.]
62          second level:  [0. 4.]
63          third level:  [3. 5.] ]
64      The No. 3  iteration is finished!
65
66  Beging the No. 4  iteration:
67      obj[gen-1] = 8.50      temp_best_value_gen = 8.50
68      No, maintain solution  and obj[gen] = 8.50 , and the tolerance_counter = 1
69      solution chromosome =
70          first level: [ [2. 8.]
71          second level:  [0. 4.]
72          third level:  [3. 5.] ]
73      The No. 4  iteration is finished!
74
75  Beging the No. 5  iteration:
76      obj[gen-1] = 8.50      temp_best_value_gen = 4.50
77      Yes, update solution and obj[gen] = 4.50
78      solution chromosome =
79          first level: [ [2. 8.]
```

```
 80        second level: [0. 2.]
 81        third level: [3. 4.] ]
 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 = 1
 87      solution chromosome =
 88        first level: [ [2. 8.]
 89        second level: [0. 2.]
 90        third level: [3. 4.] ]
 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 = 2
 96      solution chromosome =
 97        first level: [ [2. 8.]
 98        second level: [0. 2.]
 99        third level: [3. 4.] ]
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 = 3
105      solution chromosome =
106        first level: [ [2. 8.]
107        second level: [0. 2.]
108        third level: [3. 4.] ]
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 = 4
114      solution chromosome =
115        first level: [ [2. 8.]
116        second level: [0. 2.]
117        third level: [3. 4.] ]
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 = 5
123      solution chromosome =
124        first level: [ [2. 8.]
125        second level: [0. 2.]
126        third level: [3. 4.] ]
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 = 6
132      solution chromosome =
133        first level: [ [2. 8.]
134        second level: [0. 2.]
135        third level: [3. 4.] ]
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 = 7
141      solution chromosome =
142        first level: [ [2. 8.]
143        second level: [0. 2.]
144        third level: [3. 4.] ]
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 = 8
150      solution chromosome =
151        first level: [ [2. 8.]
152        second level: [0. 2.]
153        third level: [3. 4.] ]
154      The No. 13  iteration is finished!
155
156
157    ------------------------------------------------------------------------------
158    The iteration is terminated and then visulize the solution:
159      solution chromosome =
160        first level: [ [2. 8.]
161        second level: [0. 2.]
162        third level: [3. 4.] ]
163      Objective function values and some other indicators:
```

164	Obj0 = 3.00 Obj1 = 2.00 Obj0 + Obj1 = 5.00
165	Total movement of crane: 0.00
166	Total waiting time in berth position: 2.00
167	Total index of q during berthing: 38.00
168	Specific arrangement for each vessel:
169	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: 3.0
	duration_time_i: 3.0 demand_i: 160.0 work load_i: 160.0 work load gap_i: 0
170	V_id: 1 li: 8.0 xi: 8.0 bow of i: 4.0 tail of i: 12.0 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
171	
172	Algorithm finished and the total CPU time: 109 s
173	End
174	