```
 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=15257
 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_3_7 _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 =  58
21          Pop_size =  30
22          Tolerance_iteration_unchanged_number =  10
23          Chrom_size =  9
24          Iter_num_GA =  300
25          Select_rate =  0.85
26          Crossover_rate =  0.95
27          Mutation rate =  0.95
28          Mu_oper_type =  1
29          vessel_move_way =  2
30          coefficient for Obj1=  1.9
31          coefficient for Obj2=  0.10000000000000009
32          gen =  0
33
34  Iteration begin:
35  Beging the No. 0  iteration:
36      obj[0] = 10.10     temp_best_value_gen = 10.10
37      The No. 0  iteration is finished!
38
39  Beging the No. 1  iteration:
40      obj[gen-1] = 10.10   temp_best_value_gen = 10.07
41      Yes, update solution and obj[gen] = 10.07
42      solution chromosome =
43          first level: [ [1.91 6.79 4.05]
44          second level:  [0. 2. 4.]
45          third level:  [3. 4. 6.] ]
46      The No. 1  iteration is finished!
47
48  Beging the No. 2  iteration:
49      obj[gen-1] = 10.07   temp_best_value_gen = 10.07
50      No, maintain solution  and obj[gen] = 10.07 , and the tolerance_counter = 1
51      solution chromosome =
52          first level: [ [1.91 6.79 4.05]
53          second level:  [0. 2. 4.]
54          third level:  [3. 4. 6.] ]
55      The No. 2  iteration is finished!
56
57  Beging the No. 3  iteration:
58      obj[gen-1] = 10.07   temp_best_value_gen = 10.07
59      No, maintain solution  and obj[gen] = 10.07 , and the tolerance_counter = 2
60      solution chromosome =
61          first level: [ [1.91 6.79 4.05]
62          second level:  [0. 2. 4.]
63          third level:  [3. 4. 6.] ]
64      The No. 3  iteration is finished!
65
66  Beging the No. 4  iteration:
67      obj[gen-1] = 10.07   temp_best_value_gen = 10.07
68      No, maintain solution  and obj[gen] = 10.07 , and the tolerance_counter = 3
69      solution chromosome =
70          first level: [ [1.91 6.79 4.05]
71          second level:  [0. 2. 4.]
72          third level:  [3. 4. 6.] ]
73      The No. 4  iteration is finished!
74
75  Beging the No. 5  iteration:
76      obj[gen-1] = 10.07   temp_best_value_gen = 10.07
77      No, maintain solution  and obj[gen] = 10.07 , and the tolerance_counter = 4
78      solution chromosome =
79          first level: [ [1.91 6.79 4.05]
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 80      second level:  [0. 2. 4.]
 81      third level:  [3. 4. 6.] ]
 82    The No. 5  iteration is finished!
 83
 84  Beging the No. 6  iteration:
 85      obj[gen-1] = 10.07   temp_best_value_gen = 10.07
 86      No, maintain solution  and obj[gen] = 10.07 , and the tolerance_counter = 5
 87      solution chromosome =
 88      first level: [ [1.91 6.79 4.05]
 89      second level:  [0. 2. 4.]
 90      third level:  [3. 4. 6.] ]
 91    The No. 6  iteration is finished!
 92
 93  Beging the No. 7  iteration:
 94      obj[gen-1] = 10.07   temp_best_value_gen = 10.07
 95      No, maintain solution  and obj[gen] = 10.07 , and the tolerance_counter = 6
 96      solution chromosome =
 97      first level: [ [1.91 6.79 4.05]
 98      second level:  [0. 2. 4.]
 99      third level:  [3. 4. 6.] ]
100    The No. 7  iteration is finished!
101
102  Beging the No. 8  iteration:
103      obj[gen-1] = 10.07   temp_best_value_gen = 10.07
104      No, maintain solution  and obj[gen] = 10.07 , and the tolerance_counter = 7
105      solution chromosome =
106      first level: [ [1.91 6.79 4.05]
107      second level:  [0. 2. 4.]
108      third level:  [3. 4. 6.] ]
109    The No. 8  iteration is finished!
110
111  Beging the No. 9  iteration:
112      obj[gen-1] = 10.07   temp_best_value_gen = 10.07
113      No, maintain solution  and obj[gen] = 10.07 , and the tolerance_counter = 8
114      solution chromosome =
115      first level: [ [1.91 6.79 4.05]
116      second level:  [0. 2. 4.]
117      third level:  [3. 4. 6.] ]
118    The No. 9  iteration is finished!
119
120  Beging the No. 10  iteration:
121      obj[gen-1] = 10.07   temp_best_value_gen = 10.07
122      No, maintain solution  and obj[gen] = 10.07 , and the tolerance_counter = 9
123      solution chromosome =
124      first level: [ [1.91 6.79 4.05]
125      second level:  [0. 2. 4.]
126      third level:  [3. 4. 6.] ]
127    The No. 10  iteration is finished!
128
129  Beging the No. 11  iteration:
130      obj[gen-1] = 10.07   temp_best_value_gen = 4.00
131      Yes, update solution and obj[gen] = 4.00
132      solution chromosome =
133      first level: [ [ 1.5  6.5 13. ]
134      second level:  [0. 1. 1.]
135      third level:  [3. 3. 3.] ]
136    The No. 11  iteration is finished!
137
138  Beging the No. 12  iteration:
139      obj[gen-1] = 4.00    temp_best_value_gen = 4.00
140      No, maintain solution  and obj[gen] = 4.00 , and the tolerance_counter = 1
141      solution chromosome =
142      first level: [ [ 1.5  6.5 13. ]
143      second level:  [0. 1. 1.]
144      third level:  [3. 3. 3.] ]
145    The No. 12  iteration is finished!
146
147  Beging the No. 13  iteration:
148      obj[gen-1] = 4.00    temp_best_value_gen = 4.00
149      No, maintain solution  and obj[gen] = 4.00 , and the tolerance_counter = 2
150      solution chromosome =
151      first level: [ [ 1.5  6.5 13. ]
152      second level:  [0. 1. 1.]
153      third level:  [3. 3. 3.] ]
154    The No. 13  iteration is finished!
155
156  Beging the No. 14  iteration:
157      obj[gen-1] = 4.00    temp_best_value_gen = 4.00
158      No, maintain solution  and obj[gen] = 4.00 , and the tolerance_counter = 3
159      solution chromosome =
160      first level: [ [ 1.5  6.5 13. ]
161      second level:  [0. 1. 1.]
162      third level:  [3. 3. 3.] ]
163    The No. 14  iteration is finished!
```

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164
165  Beging the No. 15  iteration:
166    obj[gen-1] = 4.00    temp_best_value_gen = 4.00
167    No, maintain solution  and obj[gen] = 4.00 , and the tolerance_counter = 4
168    solution chromosome =
169      first level: [ [ 1.5  6.5 13. ]
170      second level: [0. 1. 1.]
171      third level: [3. 3. 3.] ]
172    The No. 15  iteration is finished!
173
174  Beging the No. 16  iteration:
175    obj[gen-1] = 4.00    temp_best_value_gen = 4.00
176    No, maintain solution  and obj[gen] = 4.00 , and the tolerance_counter = 5
177    solution chromosome =
178      first level: [ [ 1.5  6.5 13. ]
179      second level: [0. 1. 1.]
180      third level: [3. 3. 3.] ]
181    The No. 16  iteration is finished!
182
183  Beging the No. 17  iteration:
184    obj[gen-1] = 4.00    temp_best_value_gen = 4.00
185    No, maintain solution  and obj[gen] = 4.00 , and the tolerance_counter = 6
186    solution chromosome =
187      first level: [ [ 1.5  6.5 13. ]
188      second level: [0. 1. 1.]
189      third level: [3. 3. 3.] ]
190    The No. 17  iteration is finished!
191
192  Beging the No. 18  iteration:
193    obj[gen-1] = 4.00    temp_best_value_gen = 4.00
194    No, maintain solution  and obj[gen] = 4.00 , and the tolerance_counter = 7
195    solution chromosome =
196      first level: [ [ 1.5  6.5 13. ]
197      second level: [0. 1. 1.]
198      third level: [3. 3. 3.] ]
199    The No. 18  iteration is finished!
200
201  Beging the No. 19  iteration:
202    obj[gen-1] = 4.00    temp_best_value_gen = 4.00
203    No, maintain solution  and obj[gen] = 4.00 , and the tolerance_counter = 8
204    solution chromosome =
205      first level: [ [ 1.5  6.5 13. ]
206      second level: [0. 1. 1.]
207      third level: [3. 3. 3.] ]
208    The No. 19  iteration is finished!
209
210  Beging the No. 20  iteration:
211    obj[gen-1] = 4.00    temp_best_value_gen = 4.00
212    No, maintain solution  and obj[gen] = 4.00 , and the tolerance_counter = 9
213    solution chromosome =
214      first level: [ [ 1.5  6.5 13. ]
215      second level: [0. 1. 1.]
216      third level: [3. 3. 3.] ]
217    The No. 20  iteration is finished!
218
219  Beging the No. 21  iteration:
220    obj[gen-1] = 4.00    temp_best_value_gen = 4.00
221    No, maintain solution  and obj[gen] = 4.00 , and the tolerance_counter = 10
222    solution chromosome =
223      first level: [ [ 1.5  6.5 13. ]
224      second level: [0. 1. 1.]
225      third level: [3. 3. 3.] ]
226    The No. 21  iteration is finished!
227
228
229  ------------------------------------------------------------------------------------
230  The iteration is terminated and then visulize the solution:
231    solution chromosome =
232      first level: [ [ 1.5  6.5 13. ]
233      second level: [0. 1. 1.]
234      third level: [3. 3. 3.] ]
235    Objective function values and some other indicators:
236      Obj0 = 2.00          Obj1 = 2.00          Obj0 + Obj1 = 4.00
237      Total movement of crane: 0.00
238      Total waiting time in berth position: 2.00
239      Total index of q during berthing: 63.00
240      Specific arrangement for each vessel:
241        V_id: 0          li: 3.0          xi: 1.5          bow of i: 0.0          tail of i: 3.0          gama_i0: 0.0          gama_i1: 2.0
                           duration_time_i: 2.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
242        V_id: 1          li: 7.0          xi: 6.5          bow of i: 3.0          tail of i: 10.0          gama_i0: 1.0          gama_i1: 3.0
                           duration_time_i: 2.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
243        V_id: 2          li: 6.0          xi: 13.0          bow of i: 10.0          tail of i: 16.0          gama_i0: 1.0          gama_i1: 2
     .0                    duration_time_i: 1.0          demand_i: 60.0          work load_i: 60.0          work load gap_i: 0
244
```

```
245   Algorithm finished and the total CPU time: 756 s
246   End
247
```

```
245   Algorithm finished and the total CPU time: 756 s
246   End
247
```