```
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=12878
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] = 10.67     temp_best_value_gen = 10.67
37     The No. 0  iteration is finished!
38
39  Beging the No. 1  iteration:
40     obj[gen-1] = 10.67   temp_best_value_gen = 8.50
41     Yes, update solution and obj[gen] = 8.50
42     solution chromosome =
43       first level: [ [8. 4.]
44       second level:  [2. 0.]
45       third level:  [2. 3.] ]
46     The No. 1  iteration is finished!
47
48  Beging the No. 2  iteration:
49     obj[gen-1] = 8.50     temp_best_value_gen = 8.50
50     No, maintain solution  and obj[gen] = 8.50 , and the tolerance_counter = 1
51     solution chromosome =
52       first level: [ [8. 4.]
53       second level:  [2. 0.]
54       third level:  [2. 3.] ]
55     The No. 2  iteration is finished!
56
57  Beging the No. 3  iteration:
58     obj[gen-1] = 8.50     temp_best_value_gen = 8.50
59     No, maintain solution  and obj[gen] = 8.50 , and the tolerance_counter = 2
60     solution chromosome =
61       first level: [ [8. 4.]
62       second level:  [2. 0.]
63       third level:  [2. 3.] ]
64     The No. 3  iteration is finished!
65
66  Beging the No. 4  iteration:
67     obj[gen-1] = 8.50     temp_best_value_gen = 5.50
68     Yes, update solution and obj[gen] = 5.50
69     solution chromosome =
70       first level: [ [8. 4.]
71       second level:  [2. 0.]
72       third level:  [4. 3.] ]
73     The No. 4  iteration is finished!
74
75  Beging the No. 5  iteration:
76     obj[gen-1] = 5.50     temp_best_value_gen = 5.50
77     No, maintain solution  and obj[gen] = 5.50 , and the tolerance_counter = 1
78     solution chromosome =
79       first level: [ [8. 4.]
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80        second level: [2. 0.]
81        third level: [4. 3.] ]
82      The No. 5  iteration is finished!
83
84    Beging the No. 6  iteration:
85      obj[gen-1] = 5.50    temp_best_value_gen = 5.50
86      No, maintain solution  and obj[gen] = 5.50 , and the tolerance_counter = 2
87      solution chromosome =
88        first level: [ [8. 4.]
89        second level: [2. 0.]
90        third level: [4. 3.] ]
91      The No. 6  iteration is finished!
92
93    Beging the No. 7  iteration:
94      obj[gen-1] = 5.50    temp_best_value_gen = 5.50
95      No, maintain solution  and obj[gen] = 5.50 , and the tolerance_counter = 3
96      solution chromosome =
97        first level: [ [8. 4.]
98        second level: [2. 0.]
99        third level: [4. 3.] ]
100     The No. 7  iteration is finished!
101
102   Beging the No. 8  iteration:
103     obj[gen-1] = 5.50    temp_best_value_gen = 5.50
104     No, maintain solution  and obj[gen] = 5.50 , and the tolerance_counter = 4
105     solution chromosome =
106       first level: [ [8. 4.]
107       second level: [2. 0.]
108       third level: [4. 3.] ]
109     The No. 8  iteration is finished!
110
111   Beging the No. 9  iteration:
112     obj[gen-1] = 5.50    temp_best_value_gen = 5.50
113     No, maintain solution  and obj[gen] = 5.50 , and the tolerance_counter = 5
114     solution chromosome =
115       first level: [ [8. 4.]
116       second level: [2. 0.]
117       third level: [4. 3.] ]
118     The No. 9  iteration is finished!
119
120   Beging the No. 10  iteration:
121     obj[gen-1] = 5.50    temp_best_value_gen = 5.50
122     No, maintain solution  and obj[gen] = 5.50 , and the tolerance_counter = 6
123     solution chromosome =
124       first level: [ [8. 4.]
125       second level: [2. 0.]
126       third level: [4. 3.] ]
127     The No. 10  iteration is finished!
128
129   Beging the No. 11  iteration:
130     obj[gen-1] = 5.50    temp_best_value_gen = 3.00
131     Yes, update solution and obj[gen] = 3.00
132     solution chromosome =
133       first level: [ [2. 8.]
134       second level: [0. 0.]
135       third level: [3. 2.] ]
136     The No. 11  iteration is finished!
137
138   Beging the No. 12  iteration:
139     obj[gen-1] = 3.00    temp_best_value_gen = 3.00
140     No, maintain solution  and obj[gen] = 3.00 , and the tolerance_counter = 1
141     solution chromosome =
142       first level: [ [2. 8.]
143       second level: [0. 0.]
144       third level: [3. 2.] ]
145     The No. 12  iteration is finished!
146
147   Beging the No. 13  iteration:
148     obj[gen-1] = 3.00    temp_best_value_gen = 3.00
149     No, maintain solution  and obj[gen] = 3.00 , and the tolerance_counter = 2
150     solution chromosome =
151       first level: [ [2. 8.]
152       second level: [0. 0.]
153       third level: [3. 2.] ]
154     The No. 13  iteration is finished!
155
156   Beging the No. 14  iteration:
157     obj[gen-1] = 3.00    temp_best_value_gen = 3.00
158     No, maintain solution  and obj[gen] = 3.00 , and the tolerance_counter = 3
159     solution chromosome =
160       first level: [ [2. 8.]
161       second level: [0. 0.]
162       third level: [3. 2.] ]
163     The No. 14  iteration is finished!
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164
165   Beging the No. 15  iteration:
166     obj[gen-1] = 3.00    temp_best_value_gen = 3.00
167     No, maintain solution  and obj[gen] = 3.00 , and the tolerance_counter = 4
168     solution chromosome =
169       first level: [ [2. 8.]
170       second level:  [0. 0.]
171       third level:  [3. 2.] ]
172     The No. 15  iteration is finished!
173
174   Beging the No. 16  iteration:
175     obj[gen-1] = 3.00    temp_best_value_gen = 3.00
176     No, maintain solution  and obj[gen] = 3.00 , and the tolerance_counter = 5
177     solution chromosome =
178       first level: [ [2. 8.]
179       second level:  [0. 0.]
180       third level:  [3. 2.] ]
181     The No. 16  iteration is finished!
182
183   Beging the No. 17  iteration:
184     obj[gen-1] = 3.00    temp_best_value_gen = 3.00
185     No, maintain solution  and obj[gen] = 3.00 , and the tolerance_counter = 6
186     solution chromosome =
187       first level: [ [2. 8.]
188       second level:  [0. 0.]
189       third level:  [3. 2.] ]
190     The No. 17  iteration is finished!
191
192   Beging the No. 18  iteration:
193     obj[gen-1] = 3.00    temp_best_value_gen = 3.00
194     No, maintain solution  and obj[gen] = 3.00 , and the tolerance_counter = 7
195     solution chromosome =
196       first level: [ [2. 8.]
197       second level:  [0. 0.]
198       third level:  [3. 2.] ]
199     The No. 18  iteration is finished!
200
201   Beging the No. 19  iteration:
202     obj[gen-1] = 3.00    temp_best_value_gen = 3.00
203     No, maintain solution  and obj[gen] = 3.00 , and the tolerance_counter = 8
204     solution chromosome =
205       first level: [ [2. 8.]
206       second level:  [0. 0.]
207       third level:  [3. 2.] ]
208     The No. 19  iteration is finished!
209
210   Beging the No. 20  iteration:
211     obj[gen-1] = 3.00    temp_best_value_gen = 3.00
212     No, maintain solution  and obj[gen] = 3.00 , and the tolerance_counter = 9
213     solution chromosome =
214       first level: [ [2. 8.]
215       second level:  [0. 0.]
216       third level:  [3. 2.] ]
217     The No. 20  iteration is finished!
218
219   Beging the No. 21  iteration:
220     obj[gen-1] = 3.00    temp_best_value_gen = 3.00
221     No, maintain solution  and obj[gen] = 3.00 , and the tolerance_counter = 10
222     solution chromosome =
223       first level: [ [2. 8.]
224       second level:  [0. 0.]
225       third level:  [3. 2.] ]
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: [ [2. 8.]
233       second level:  [0. 0.]
234       third level:  [3. 2.] ]
235     Objective function values and some other indicators:
236       Obj0 = 2.00            Obj1 = 0.00           Obj0 + Obj1 = 2.00
237       Total movement of crane: 0.00
238       Total waiting time in berth position: 0.00
239       Total index of q during berthing: 34.00
240     Specific arrangement for each vessel:
241       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
242       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: 3.0
                            duration_time_i: 3.0          demand_i: 120.0     work load_i: 120.0     work load gap_i: 0
243
244   Algorithm finished and the total CPU time: 679 s
245   End
```