

```

1 "E:\1 \ \ \ \ \3 \ \ \ \ \ \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=4606
2
3 import sys; print('Python %s on %s' % (sys.version, sys.platform))
4 sys.path.extend(['E:\1 \ \ \ \ \3 \ \ \ \ \ \1 \ \ \ \ \ \ \ \ \ \ \ \1 \ \ \ \ \ \ \ \ \ \ \ \1_LW_ \ \ \ \ \2\6 \ \ \ \ \2 python code\
   01_My_Python_Code', 'E:/1 \ \ \ \ \3 \ \ \ \ \ \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_LW_ \ \ \ \ \2\6 \ \ \ \ \2 python code\01_My_Python_Code/
   main_BACASP_official_ENSGA-II.py', wdir='E:/1 \ \ \ \ \3 \ \ \ \ \ \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] = 7.00   temp_best_value_gen = 7.00
37   The No. 0 iteration is finished!
38
39 Beging the No. 1 iteration:
40   obj[gen-1] = 7.00   temp_best_value_gen = 7.00
41   No, maintain solution and obj[gen] = 7.00 , and the tolerance_counter = 1
42   solution chromosome =
43     first level: [ [2. 8.]
44     second level: [2. 1.]
45     third level: [2. 4.] ]
46   The No. 1 iteration is finished!
47
48 Beging the No. 2 iteration:
49   obj[gen-1] = 7.00   temp_best_value_gen = 7.00
50   No, maintain solution and obj[gen] = 7.00 , and the tolerance_counter = 2
51   solution chromosome =
52     first level: [ [2. 8.]
53     second level: [2. 1.]
54     third level: [2. 4.] ]
55   The No. 2 iteration is finished!
56
57 Beging the No. 3 iteration:
58   obj[gen-1] = 7.00   temp_best_value_gen = 6.86
59   Yes, update solution and obj[gen] = 6.86
60   solution chromosome =
61     first level: [ [2. 4.02]
62     second level: [2. 0.]
63     third level: [2. 6.] ]
64   The No. 3 iteration is finished!
65
66 Beging the No. 4 iteration:
67   obj[gen-1] = 6.86   temp_best_value_gen = 5.29
68   Yes, update solution and obj[gen] = 5.29
69   solution chromosome =
70     first level: [ [2.14 4.02]
71     second level: [1. 0.]
72     third level: [4. 6.] ]
73   The No. 4 iteration is finished!
74
75 Beging the No. 5 iteration:
76   obj[gen-1] = 5.29   temp_best_value_gen = 5.29
77   No, maintain solution and obj[gen] = 5.29 , and the tolerance_counter = 1
78   solution chromosome =
79     first level: [ [2.14 4.02]

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80     second level: [1. 0.]
81     third level: [4. 6.] ]
82     The No. 5 iteration is finished!
83
84     Beging the No. 6 iteration:
85     obj[gen-1] = 5.29    temp_best_value_gen = 5.29
86     No, maintain solution and obj[gen] = 5.29 , and the tolerance_counter = 2
87     solution chromosome =
88     first level: [ [2.14 4.02]
89     second level: [1. 0.]
90     third level: [4. 6.] ]
91     The No. 6 iteration is finished!
92
93     Beging the No. 7 iteration:
94     obj[gen-1] = 5.29    temp_best_value_gen = 5.11
95     Yes, update solution and obj[gen] = 5.11
96     solution chromosome =
97     first level: [ [2.1 4.02]
98     second level: [1. 0.]
99     third level: [3. 6.] ]
100    The No. 7 iteration is finished!
101
102    Beging the No. 8 iteration:
103    obj[gen-1] = 5.11    temp_best_value_gen = 5.11
104    No, maintain solution and obj[gen] = 5.11 , and the tolerance_counter = 1
105    solution chromosome =
106    first level: [ [2.1 4.02]
107    second level: [1. 0.]
108    third level: [3. 6.] ]
109    The No. 8 iteration is finished!
110
111    Beging the No. 9 iteration:
112    obj[gen-1] = 5.11    temp_best_value_gen = 5.11
113    No, maintain solution and obj[gen] = 5.11 , and the tolerance_counter = 2
114    solution chromosome =
115    first level: [ [2.1 4.02]
116    second level: [1. 0.]
117    third level: [3. 6.] ]
118    The No. 9 iteration is finished!
119
120    Beging the No. 10 iteration:
121    obj[gen-1] = 5.11    temp_best_value_gen = 5.11
122    No, maintain solution and obj[gen] = 5.11 , and the tolerance_counter = 3
123    solution chromosome =
124    first level: [ [2.1 4.02]
125    second level: [1. 0.]
126    third level: [3. 6.] ]
127    The No. 10 iteration is finished!
128
129    Beging the No. 11 iteration:
130    obj[gen-1] = 5.11    temp_best_value_gen = 5.11
131    No, maintain solution and obj[gen] = 5.11 , and the tolerance_counter = 4
132    solution chromosome =
133    first level: [ [2.1 4.02]
134    second level: [1. 0.]
135    third level: [3. 6.] ]
136    The No. 11 iteration is finished!
137
138    Beging the No. 12 iteration:
139    obj[gen-1] = 5.11    temp_best_value_gen = 5.11
140    No, maintain solution and obj[gen] = 5.11 , and the tolerance_counter = 5
141    solution chromosome =
142    first level: [ [2.1 4.02]
143    second level: [1. 0.]
144    third level: [3. 6.] ]
145    The No. 12 iteration is finished!
146
147    Beging the No. 13 iteration:
148    obj[gen-1] = 5.11    temp_best_value_gen = 5.11
149    No, maintain solution and obj[gen] = 5.11 , and the tolerance_counter = 6
150    solution chromosome =
151    first level: [ [2.1 4.02]
152    second level: [1. 0.]
153    third level: [3. 6.] ]
154    The No. 13 iteration is finished!
155
156    Beging the No. 14 iteration:
157    obj[gen-1] = 5.11    temp_best_value_gen = 5.11
158    No, maintain solution and obj[gen] = 5.11 , and the tolerance_counter = 7
159    solution chromosome =
160    first level: [ [2.1 4.02]
161    second level: [1. 0.]
162    third level: [3. 6.] ]
163    The No. 14 iteration is finished!

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164
165 Beging the No. 15 iteration:
166 obj[gen-1] = 5.11 temp_best_value_gen = 5.11
167 No, maintain solution and obj[gen] = 5.11 , and the tolerance_counter = 8
168 solution chromosome =
169 first level: [ [2.1 4.02]
170 second level: [1. 0.]
171 third level: [3. 6.] ]
172 The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175 obj[gen-1] = 5.11 temp_best_value_gen = 5.11
176 No, maintain solution and obj[gen] = 5.11 , and the tolerance_counter = 9
177 solution chromosome =
178 first level: [ [2.1 4.02]
179 second level: [1. 0.]
180 third level: [3. 6.] ]
181 The No. 16 iteration is finished!
182
183 Beging the No. 17 iteration:
184 obj[gen-1] = 5.11 temp_best_value_gen = 5.11
185 No, maintain solution and obj[gen] = 5.11 , and the tolerance_counter = 10
186 solution chromosome =
187 first level: [ [2.1 4.02]
188 second level: [1. 0.]
189 third level: [3. 6.] ]
190 The No. 17 iteration is finished!
191
192
193 -----
194 The iteration is terminated and then visulize the solution:
195 solution chromosome =
196 first level: [ [2.1 4.02]
197 second level: [1. 0.]
198 third level: [3. 6.] ]
199 Objective function values and some other indicators:
200 Obj0 = 3.00 Obj1 = 2.41 Obj0 + Obj1 = 5.41
201 Total movement of crane: 1.41
202 Total waiting time in berth position: 1.00
203 Total index of q during berthing: 22.00
204 Specific arrangement for each vessel:
205 V_id: 0 li: 4.0 xi: 2.1 bow of i: 0.1 tail of i: 4.1 gama_i0: 1.0 gama_i1: 4.0
206 duration_time_i: 3.0 demand_i: 160.0 work load_i: 160.0 work load gap_i: 0
207 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
208 duration_time_i: 1.0 demand_i: 120.0 work load_i: 120.0 work load gap_i: 0
209
210
207
208 Algorithm finished and the total CPU time: 294 s
209 End
210

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