

```

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=19878
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_5_2_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 = 15
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] = 18.87   temp_best_value_gen = 18.87
37   The No. 0 iteration is finished!
38
39 Beging the No. 1 iteration:
40   obj[gen-1] = 18.87   temp_best_value_gen = 18.30
41   Yes, update solution and obj[gen] = 18.30
42   solution chromosome =
43     first level: [ [ 4.5 23. 17.5 11.5 25.5]
44     second level: [ 5. 5. 1. 1. 1.]
45     third level: [ 8. 2. 2. 2. 9.] ]
46   The No. 1 iteration is finished!
47
48 Beging the No. 2 iteration:
49   obj[gen-1] = 18.30   temp_best_value_gen = 18.30
50   No, maintain solution and obj[gen] = 18.30 , and the tolerance_counter = 1
51   solution chromosome =
52     first level: [ [ 4.5 23. 17.5 11.5 25.5]
53     second level: [ 5. 5. 1. 1. 1.]
54     third level: [ 8. 2. 2. 2. 9.] ]
55   The No. 2 iteration is finished!
56
57 Beging the No. 3 iteration:
58   obj[gen-1] = 18.30   temp_best_value_gen = 17.90
59   Yes, update solution and obj[gen] = 17.90
60   solution chromosome =
61     first level: [ [ 4.5 23. 17.5 11.5 25.5]
62     second level: [ 1. 5. 1. 1. 1.]
63     third level: [ 5. 2. 2. 2. 9.] ]
64   The No. 3 iteration is finished!
65
66 Beging the No. 4 iteration:
67   obj[gen-1] = 17.90   temp_best_value_gen = 17.90
68   No, maintain solution and obj[gen] = 17.90 , and the tolerance_counter = 1
69   solution chromosome =
70     first level: [ [ 4.5 23. 17.5 11.5 25.5]
71     second level: [ 1. 5. 1. 1. 1.]
72     third level: [ 5. 2. 2. 2. 9.] ]
73   The No. 4 iteration is finished!
74
75 Beging the No. 5 iteration:
76   obj[gen-1] = 17.90   temp_best_value_gen = 17.90
77   No, maintain solution and obj[gen] = 17.90 , and the tolerance_counter = 2
78   solution chromosome =
79     first level: [ [ 4.5 23. 17.5 11.5 25.5]

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80     second level: [1. 5. 1. 1. 1.]
81     third level: [5. 2. 2. 2. 9.] ]
82     The No. 5 iteration is finished!
83
84 Beging the No. 6 iteration:
85     obj[gen-1] = 17.90 temp_best_value_gen = 13.20
86     Yes, update solution and obj[gen] = 13.20
87     solution chromosome =
88     first level: [ [ 4.5 11.5 17.5 23. 25.5]
89     second level: [1. 1. 2. 0. 4.]
90     third level: [5. 2. 4. 2. 9.] ]
91     The No. 6 iteration is finished!
92
93 Beging the No. 7 iteration:
94     obj[gen-1] = 13.20 temp_best_value_gen = 13.20
95     No, maintain solution and obj[gen] = 13.20 , and the tolerance_counter = 1
96     solution chromosome =
97     first level: [ [ 4.5 11.5 17.5 23. 25.5]
98     second level: [1. 1. 2. 0. 4.]
99     third level: [5. 2. 4. 2. 9.] ]
100    The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
103     obj[gen-1] = 13.20 temp_best_value_gen = 13.20
104     No, maintain solution and obj[gen] = 13.20 , and the tolerance_counter = 2
105     solution chromosome =
106     first level: [ [ 4.5 11.5 17.5 23. 25.5]
107     second level: [1. 1. 2. 0. 4.]
108     third level: [5. 2. 4. 2. 9.] ]
109    The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112     obj[gen-1] = 13.20 temp_best_value_gen = 13.20
113     No, maintain solution and obj[gen] = 13.20 , and the tolerance_counter = 3
114     solution chromosome =
115     first level: [ [ 4.5 11.5 17.5 23. 25.5]
116     second level: [1. 1. 2. 0. 4.]
117     third level: [5. 2. 4. 2. 9.] ]
118    The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121     obj[gen-1] = 13.20 temp_best_value_gen = 13.20
122     No, maintain solution and obj[gen] = 13.20 , and the tolerance_counter = 4
123     solution chromosome =
124     first level: [ [ 4.5 11.5 17.5 23. 25.5]
125     second level: [1. 1. 2. 0. 4.]
126     third level: [5. 2. 4. 2. 9.] ]
127    The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130     obj[gen-1] = 13.20 temp_best_value_gen = 13.20
131     No, maintain solution and obj[gen] = 13.20 , and the tolerance_counter = 5
132     solution chromosome =
133     first level: [ [ 4.5 11.5 17.5 23. 25.5]
134     second level: [1. 1. 2. 0. 4.]
135     third level: [5. 2. 4. 2. 9.] ]
136    The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139     obj[gen-1] = 13.20 temp_best_value_gen = 13.20
140     No, maintain solution and obj[gen] = 13.20 , and the tolerance_counter = 6
141     solution chromosome =
142     first level: [ [ 4.5 11.5 17.5 23. 25.5]
143     second level: [1. 1. 2. 0. 4.]
144     third level: [5. 2. 4. 2. 9.] ]
145    The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
148     obj[gen-1] = 13.20 temp_best_value_gen = 13.20
149     No, maintain solution and obj[gen] = 13.20 , and the tolerance_counter = 7
150     solution chromosome =
151     first level: [ [ 4.5 11.5 17.5 23. 25.5]
152     second level: [1. 1. 2. 0. 4.]
153     third level: [5. 2. 4. 2. 9.] ]
154    The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157     obj[gen-1] = 13.20 temp_best_value_gen = 13.20
158     No, maintain solution and obj[gen] = 13.20 , and the tolerance_counter = 8
159     solution chromosome =
160     first level: [ [ 4.5 11.5 17.5 23. 25.5]
161     second level: [1. 1. 2. 0. 4.]
162     third level: [5. 2. 4. 2. 9.] ]
163    The No. 14 iteration is finished!

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164
165 Beging the No. 15 iteration:
166 obj[gen-1] = 13.20 temp_best_value_gen = 13.20
167 No, maintain solution and obj[gen] = 13.20 , and the tolerance_counter = 9
168 solution chromosome =
169     first level: [ [ 4.5 11.5 17.5 23. 25.5]
170     second level: [1. 1. 2. 0. 4.]
171     third level: [5. 2. 4. 2. 9.] ]
172 The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175 obj[gen-1] = 13.20 temp_best_value_gen = 13.20
176 No, maintain solution and obj[gen] = 13.20 , and the tolerance_counter = 10
177 solution chromosome =
178     first level: [ [ 4.5 11.5 17.5 23. 25.5]
179     second level: [1. 1. 2. 0. 4.]
180     third level: [5. 2. 4. 2. 9.] ]
181 The No. 16 iteration is finished!
182
183
184 -----
185 The iteration is terminated and then visulize the solution:
186 solution chromosome =
187     first level: [ [ 4.5 11.5 17.5 23. 25.5]
188     second level: [1. 1. 2. 0. 4.]
189     third level: [5. 2. 4. 2. 9.] ]
190 Objective function values and some other indicators:
191 Obj0 = 4.00          Obj1 = 56.00          Obj0 + Obj1 = 60.00
192 Total movement of crane: 48.00
193 Total waiting time in berth position: 8.00
194 Total index of q during berthing: 461.00
195 Specific arrangement for each vessel:
196 V_id: 0          li: 9.0          xi: 4.5          bow of i: 0.0          tail of i: 9.0          gama_i0: 1.0          gama_i1: 2.0
197     duration_time_i: 1.0          demand_i: 100.0          work load_i: 100.0          work load gap_i: 0
198 V_id: 1          li: 5.0          xi: 11.5          bow of i: 9.0          tail of i: 14.0          gama_i0: 1.0          gama_i1: 3
199     duration_time_i: 2.0          demand_i: 80.0          work load_i: 80.0          work load gap_i: 0
200 V_id: 2          li: 7.0          xi: 17.5          bow of i: 14.0          tail of i: 21.0          gama_i0: 2.0          gama_i1: 4
201     duration_time_i: 2.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
202 V_id: 3          li: 4.0          xi: 23.0          bow of i: 21.0          tail of i: 25.0          gama_i0: 0.0          gama_i1: 4
203     duration_time_i: 4.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
204 V_id: 4          li: 9.0          xi: 25.5          bow of i: 21.0          tail of i: 30.0          gama_i0: 4.0          gama_i1: 5
205     duration_time_i: 1.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
206
207 Algorithm finished and the total CPU time: 948 s
208 End
209

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