

```

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=18506
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_6_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 = 18
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] = 26.10   temp_best_value_gen = 26.10
37   The No. 0 iteration is finished!
38
39 Beging the No. 1 iteration:
40   obj[gen-1] = 26.10   temp_best_value_gen = 26.10
41   No, maintain solution and obj[gen] = 26.10 , and the tolerance_counter = 1
42   solution chromosome =
43     first level: [ [ 2.5 8. 12.5 15.5 21. 26.5]
44     second level: [0. 6. 3. 2. 8. 1.]
45     third level: [2. 2. 3. 2. 3. 4.] ]
46   The No. 1 iteration is finished!
47
48 Beging the No. 2 iteration:
49   obj[gen-1] = 26.10   temp_best_value_gen = 26.10
50   No, maintain solution and obj[gen] = 26.10 , and the tolerance_counter = 2
51   solution chromosome =
52     first level: [ [ 2.5 8. 12.5 15.5 21. 26.5]
53     second level: [0. 6. 3. 2. 8. 1.]
54     third level: [2. 2. 3. 2. 3. 4.] ]
55   The No. 2 iteration is finished!
56
57 Beging the No. 3 iteration:
58   obj[gen-1] = 26.10   temp_best_value_gen = 26.10
59   No, maintain solution and obj[gen] = 26.10 , and the tolerance_counter = 3
60   solution chromosome =
61     first level: [ [ 2.5 8. 12.5 15.5 21. 26.5]
62     second level: [0. 6. 3. 2. 8. 1.]
63     third level: [2. 2. 3. 2. 3. 4.] ]
64   The No. 3 iteration is finished!
65
66 Beging the No. 4 iteration:
67   obj[gen-1] = 26.10   temp_best_value_gen = 26.10
68   No, maintain solution and obj[gen] = 26.10 , and the tolerance_counter = 4
69   solution chromosome =
70     first level: [ [ 2.5 8. 12.5 15.5 21. 26.5]
71     second level: [0. 6. 3. 2. 8. 1.]
72     third level: [2. 2. 3. 2. 3. 4.] ]
73   The No. 4 iteration is finished!
74
75 Beging the No. 5 iteration:
76   obj[gen-1] = 26.10   temp_best_value_gen = 26.10
77   No, maintain solution and obj[gen] = 26.10 , and the tolerance_counter = 5
78   solution chromosome =
79     first level: [ [ 2.5 8. 12.5 15.5 21. 26.5]

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80     second level: [0. 6. 3. 2. 8. 1.]
81     third level: [2. 2. 3. 2. 3. 4.]
82     The No. 5 iteration is finished!
83
84     Beging the No. 6 iteration:
85     obj[gen-1] = 26.10   temp_best_value_gen = 26.10
86     No, maintain solution and obj[gen] = 26.10 , and the tolerance_counter = 6
87     solution chromosome =
88     first level: [ [ 2.5  8. 12.5 15.5 21. 26.5]
89     second level: [0. 6. 3. 2. 8. 1.]
90     third level: [2. 2. 3. 2. 3. 4.] ]
91     The No. 6 iteration is finished!
92
93     Beging the No. 7 iteration:
94     obj[gen-1] = 26.10   temp_best_value_gen = 26.10
95     No, maintain solution and obj[gen] = 26.10 , and the tolerance_counter = 7
96     solution chromosome =
97     first level: [ [ 2.5  8. 12.5 15.5 21. 26.5]
98     second level: [0. 6. 3. 2. 8. 1.]
99     third level: [2. 2. 3. 2. 3. 4.] ]
100    The No. 7 iteration is finished!
101
102    Beging the No. 8 iteration:
103    obj[gen-1] = 26.10   temp_best_value_gen = 26.10
104    No, maintain solution and obj[gen] = 26.10 , and the tolerance_counter = 8
105    solution chromosome =
106    first level: [ [ 2.5  8. 12.5 15.5 21. 26.5]
107    second level: [0. 6. 3. 2. 8. 1.]
108    third level: [2. 2. 3. 2. 3. 4.] ]
109    The No. 8 iteration is finished!
110
111    Beging the No. 9 iteration:
112    obj[gen-1] = 26.10   temp_best_value_gen = 26.10
113    No, maintain solution and obj[gen] = 26.10 , and the tolerance_counter = 9
114    solution chromosome =
115    first level: [ [ 2.5  8. 12.5 15.5 21. 26.5]
116    second level: [0. 6. 3. 2. 8. 1.]
117    third level: [2. 2. 3. 2. 3. 4.] ]
118    The No. 9 iteration is finished!
119
120    Beging the No. 10 iteration:
121    obj[gen-1] = 26.10   temp_best_value_gen = 26.10
122    No, maintain solution and obj[gen] = 26.10 , and the tolerance_counter = 10
123    solution chromosome =
124    first level: [ [ 2.5  8. 12.5 15.5 21. 26.5]
125    second level: [0. 6. 3. 2. 8. 1.]
126    third level: [2. 2. 3. 2. 3. 4.] ]
127    The No. 10 iteration is finished!
128
129
130 -----
131 The iteration is terminated and then visulize the solution:
132 solution chromosome =
133 first level: [ [ 2.5  8. 12.5 15.5 21. 26.5]
134 second level: [0. 6. 3. 2. 8. 1.]
135 third level: [2. 2. 3. 2. 3. 4.] ]
136 Objective function values and some other indicators:
137 Obj0 = 11.00      Obj1 = 52.00      Obj0 + Obj1 = 63.00
138 Total movement of crane: 32.00
139 Total waiting time in berth position: 20.00
140 Total index of q during berthing: 663.00
141 Specific arrangement for each vessel:
142 V_id: 0          li: 5.0          xi: 2.5          bow of i: 0.0          tail of i: 5.0          gama_i0: 0.0          gama_i1: 4.0
143           duration_time_i: 4.0          demand_i: 140.0          work load_i: 140.0          work load gap_i: 0
144 V_id: 1          li: 6.0          xi: 8.0          bow of i: 5.0          tail of i: 11.0          gama_i0: 6.0          gama_i1: 9.0
145           duration_time_i: 3.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
146 V_id: 2          li: 3.0          xi: 12.5         bow of i: 11.0          tail of i: 14.0          gama_i0: 3.0          gama_i1: 5
147           duration_time_i: 2.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
148 V_id: 3          li: 3.0          xi: 15.5         bow of i: 14.0          tail of i: 17.0          gama_i0: 2.0          gama_i1: 5
149           duration_time_i: 3.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
150 V_id: 4          li: 8.0          xi: 21.0         bow of i: 17.0          tail of i: 25.0          gama_i0: 8.0          gama_i1:
151           duration_time_i: 4.0          demand_i: 200.0          work load_i: 200.0          work load gap_i: 0
152 V_id: 5          li: 7.0          xi: 26.5         bow of i: 23.0          tail of i: 30.0          gama_i0: 1.0          gama_i1: 5
153           duration_time_i: 4.0          demand_i: 280.0          work load_i: 280.0          work load gap_i: 0
154
155 Algorithm finished and the total CPU time: 752 s
156 End
157

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