

```

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=39480
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_11_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 = 33
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] = 27.30   temp_best_value_gen = 27.30
37   The No. 0 iteration is finished!
38
39 Beging the No. 1 iteration:
40   obj[gen-1] = 27.30   temp_best_value_gen = 27.30
41   No, maintain solution and obj[gen] = 27.30 , and the tolerance_counter = 1
42   solution chromosome =
43     first level: [ [ 4. 10. 15. 22.5 28. 4. 3.5 4.5 4.5 2.5 3.5]
44     second level: [2. 1. 3. 7. 2. 3. 1. 0. 5. 7. 8.]
45     third level: [8. 3. 3. 2. 3. 5. 4. 8. 4. 4. 4.] ]
46   The No. 1 iteration is finished!
47
48 Beging the No. 2 iteration:
49   obj[gen-1] = 27.30   temp_best_value_gen = 27.30
50   No, maintain solution and obj[gen] = 27.30 , and the tolerance_counter = 2
51   solution chromosome =
52     first level: [ [ 4. 10. 15. 22.5 28. 4. 3.5 4.5 4.5 2.5 3.5]
53     second level: [2. 1. 3. 7. 2. 3. 1. 0. 5. 7. 8.]
54     third level: [8. 3. 3. 2. 3. 5. 4. 8. 4. 4. 4.] ]
55   The No. 2 iteration is finished!
56
57 Beging the No. 3 iteration:
58   obj[gen-1] = 27.30   temp_best_value_gen = 27.30
59   No, maintain solution and obj[gen] = 27.30 , and the tolerance_counter = 3
60   solution chromosome =
61     first level: [ [ 4. 10. 15. 22.5 28. 4. 3.5 4.5 4.5 2.5 3.5]
62     second level: [2. 1. 3. 7. 2. 3. 1. 0. 5. 7. 8.]
63     third level: [8. 3. 3. 2. 3. 5. 4. 8. 4. 4. 4.] ]
64   The No. 3 iteration is finished!
65
66 Beging the No. 4 iteration:
67   obj[gen-1] = 27.30   temp_best_value_gen = 27.30
68   No, maintain solution and obj[gen] = 27.30 , and the tolerance_counter = 4
69   solution chromosome =
70     first level: [ [ 4. 10. 15. 22.5 28. 4. 3.5 4.5 4.5 2.5 3.5]
71     second level: [2. 1. 3. 7. 2. 3. 1. 0. 5. 7. 8.]
72     third level: [8. 3. 3. 2. 3. 5. 4. 8. 4. 4. 4.] ]
73   The No. 4 iteration is finished!
74
75 Beging the No. 5 iteration:
76   obj[gen-1] = 27.30   temp_best_value_gen = 27.30
77   No, maintain solution and obj[gen] = 27.30 , and the tolerance_counter = 5
78   solution chromosome =
79     first level: [ [ 4. 10. 15. 22.5 28. 4. 3.5 4.5 4.5 2.5 3.5]

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80     second level: [2. 1. 3. 7. 2. 3. 1. 0. 5. 7. 8.]
81     third level: [8. 3. 3. 2. 3. 5. 4. 8. 4. 4. 4.] ]
82     The No. 5 iteration is finished!
83
84     Beging the No. 6 iteration:
85     obj[gen-1] = 27.30   temp_best_value_gen = 27.30
86     No, maintain solution and obj[gen] = 27.30 , and the tolerance_counter = 6
87     solution chromosome =
88     first level: [ [ 4. 10. 15. 22.5 28. 4. 3.5 4.5 4.5 2.5 3.5]
89     second level: [2. 1. 3. 7. 2. 3. 1. 0. 5. 7. 8.]
90     third level: [8. 3. 3. 2. 3. 5. 4. 8. 4. 4. 4.] ]
91     The No. 6 iteration is finished!
92
93     Beging the No. 7 iteration:
94     obj[gen-1] = 27.30   temp_best_value_gen = 27.30
95     No, maintain solution and obj[gen] = 27.30 , and the tolerance_counter = 7
96     solution chromosome =
97     first level: [ [ 4. 10. 15. 22.5 28. 4. 3.5 4.5 4.5 2.5 3.5]
98     second level: [2. 1. 3. 7. 2. 3. 1. 0. 5. 7. 8.]
99     third level: [8. 3. 3. 2. 3. 5. 4. 8. 4. 4. 4.] ]
100    The No. 7 iteration is finished!
101
102    Beging the No. 8 iteration:
103    obj[gen-1] = 27.30   temp_best_value_gen = 25.60
104    Yes, update solution and obj[gen] = 25.60
105    solution chromosome =
106    first level: [ [ 4. 10. 15. 4.5 28. 4. 3.5 4.5 4.5 22.5 3.5]
107    second level: [2. 1. 3. 7. 2. 3. 1. 0. 5. 7. 9.]
108    third level: [8. 3. 3. 4. 3. 5. 4. 8. 4. 2. 4.] ]
109    The No. 8 iteration is finished!
110
111    Beging the No. 9 iteration:
112    obj[gen-1] = 25.60   temp_best_value_gen = 25.60
113    No, maintain solution and obj[gen] = 25.60 , and the tolerance_counter = 1
114    solution chromosome =
115    first level: [ [ 4. 10. 15. 4.5 28. 4. 3.5 4.5 4.5 22.5 3.5]
116    second level: [2. 1. 3. 7. 2. 3. 1. 0. 5. 7. 9.]
117    third level: [8. 3. 3. 4. 3. 5. 4. 8. 4. 2. 4.] ]
118    The No. 9 iteration is finished!
119
120
121    -----
122    The iteration is terminated and then visulize the solution:
123    solution chromosome =
124    first level: [ [ 4. 10. 15. 4.5 28. 4. 3.5 4.5 4.5 22.5 3.5]
125    second level: [2. 1. 3. 7. 2. 3. 1. 0. 5. 7. 9.]
126    third level: [8. 3. 3. 4. 3. 5. 4. 8. 4. 2. 4.] ]
127    Objective function values and some other indicators:
128    Obj0 = 9.00           Obj1 = 85.00           Obj0 + Obj1 = 94.00
129    Total movement of crane: 36.00
130    Total waiting time in berth position: 40.00
131    Total index of q during berthing: 284.00
132    Specific arrangement for each vessel:
133    V_id: 0             li: 8.0             xi: 4.0             bow of i: 0.0             tail of i: 8.0             gama_i0: 2.0             gama_i1: 3.0
134    duration_time_i: 1.0             demand_i: 80.0             work load_i: 80.0             work load gap_i: 0
135    V_id: 1             li: 4.0             xi: 10.0            bow of i: 8.0             tail of i: 12.0            gama_i0: 1.0             gama_i1: 2
136    duration_time_i: 1.0             demand_i: 60.0             work load_i: 60.0             work load gap_i: 0
137    V_id: 2             li: 6.0             xi: 15.0            bow of i: 12.0            tail of i: 18.0            gama_i0: 3.0             gama_i1: 4
138    duration_time_i: 1.0             demand_i: 60.0             work load_i: 60.0             work load gap_i: 0
139    V_id: 3             li: 9.0             xi: 4.5             bow of i: 0.0             tail of i: 9.0             gama_i0: 7.0             gama_i1: 9.0
140    duration_time_i: 2.0             demand_i: 160.0            work load_i: 160.0            work load gap_i: 0
141    V_id: 4             li: 4.0             xi: 28.0            bow of i: 26.0            tail of i: 30.0            gama_i0: 2.0             gama_i1: 4
142    duration_time_i: 2.0             demand_i: 100.0            work load_i: 100.0            work load gap_i: 0
143    V_id: 5             li: 8.0             xi: 4.0             bow of i: 0.0             tail of i: 8.0             gama_i0: 3.0             gama_i1: 5.0
144    duration_time_i: 2.0             demand_i: 140.0            work load_i: 140.0            work load gap_i: 0
145    V_id: 6             li: 7.0             xi: 3.5             bow of i: 0.0             tail of i: 7.0             gama_i0: 1.0             gama_i1: 2.0
146    duration_time_i: 1.0             demand_i: 80.0             work load_i: 80.0             work load gap_i: 0
147    V_id: 7             li: 9.0             xi: 4.5             bow of i: 0.0             tail of i: 9.0             gama_i0: 0.0             gama_i1: 1.0
148    duration_time_i: 1.0             demand_i: 60.0             work load_i: 60.0             work load gap_i: 0
149    V_id: 8             li: 9.0             xi: 4.5             bow of i: 0.0             tail of i: 9.0             gama_i0: 5.0             gama_i1: 7.0
150    duration_time_i: 2.0             demand_i: 120.0            work load_i: 120.0            work load gap_i: 0
151    V_id: 9             li: 5.0             xi: 22.5            bow of i: 20.0            tail of i: 25.0            gama_i0: 7.0             gama_i1: 9
152    duration_time_i: 2.0             demand_i: 60.0             work load_i: 60.0             work load gap_i: 0
153    V_id: 10            li: 7.0             xi: 3.5             bow of i: 0.0             tail of i: 7.0             gama_i0: 9.0             gama_i1: 10.
154    duration_time_i: 1.0             demand_i: 80.0             work load_i: 80.0             work load gap_i: 0
155
156    Algorithm finished and the total CPU time: 1254 s
157    End
158

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