```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=53319
3
   import sys; print('Python %s on %s' % (sys.version, sys.platform))
   01_My_Python_Code'])
6
  PyDev console: starting.
  Python 3.9.7 (tags/v3.9.7:1016ef3, Aug 30 2021, 20:19:38) [MSC v.1929 64 bit (AMD64)] on win32
8
  python code/01_My_Python_Code')
10 Backend TkAgg is interactive backend. Turning interactive mode on.
   Waiting 1s.....
12
13
  This is the R_2_1 _standard_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 = 50
21
       Pop\_size = 10
       Tolerance iteration unchanged number = 8
23
       Chrom\_size = 6
       Iter_num_GA = 300
24
25
       Select_rate = 0.9
26
       Crossover rate = 0.75
       Mutation rate = 0.85
27
28
       Mu_oper_type = 2
29
       vessel\_move\_way = 1
30
       coefficient for Obj1= 1.5
       coefficient for Obj2= 0.5
31
       gen = 0
32
33
   Iteration begin:
34
35
   Beging the No. 0 iteration:
     obj[0] = 11.10 temp_best_value_gen = 11.10
36
37
     The No. 0 iteration is finished!
38
39
   Beging the No. 1 iteration:
40
     obj[gen-1] = 11.10 temp_best_value_gen = 11.10
41
     No, maintain solution and obj[gen] = 11.10, and the tolerance_counter = 1
42
     solution chromosome =
43
       first level: [ [2.11 4.13]
       second level: [0, 4.]
44
       third level: [2. 6.]]
45
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 11.10 temp_best_value_gen = 11.10
49
50
     No, maintain solution and obj[gen] = 11.10, and the tolerance_counter = 2
51
     solution chromosome =
52
       first level: [ [2.11 4.13]
53
       second level: [0. 4.]
54
       third level: [2. 6.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 11.10 temp best value gen = 11.10
59
     No, maintain solution and obj[gen] = 11.10, and the tolerance_counter = 3
60
     solution chromosome =
61
       first level: [ [2.11 4.13]
62
       second level: [0. 4.]
       third level: [2. 6.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 11.10 temp_best_value_gen = 11.10
68
     No, maintain solution and obj[gen] = 11.10, and the tolerance_counter = 4
69
     solution chromosome =
70
       first level: [ [2.11 4.13]
71
       second level: [0, 4.]
       third level: [2. 6.]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 11.10 temp best value gen = 5.00
76
     Yes, update solution and obj[gen] = 5.00
77
     solution chromosome =
78
       first level: [ [2. 8.]
```

```
second level: [0. 1.]
 81
          third level: [2. 6.]]
 82
        The No. 5 iteration is finished!
 83
     Beging the No. 6 iteration:
       obj[gen-1] = 5.00 temp_best_value_gen = 5.00
No, maintain solution_and obj[gen] = 5.00, and the tolerance_counter = 1
 85
 86
 87
        solution chromosome =
 88
          first level: [ [2. 8.]
 89
          second level: [0. 1.]
 90
          third level: [2. 6.]]
 91
        The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
 94
        obj[gen-1] = 5.00 temp_best_value_gen = 5.00
 95
        No, maintain solution and obj[gen] = 5.00, and the tolerance_counter = 2
 96
        solution chromosome =
 97
          first level: [ [2. 8.]
 98
          second level: [0. 1.]
 99
          third level: [2. 6.]]
100
        The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
        obj[gen-1] = 5.00 temp best value gen = 5.00
103
104
        No, maintain solution and obj[gen] = 5.00, and the tolerance_counter = 3
105
        solution chromosome =
          first level: [ [2. 8.]
106
107
          second level: [0. 1.]
108
          third level: [2. 6.]]
109
        The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 5.00 temp_best_value_gen = 5.00
113
        No, maintain solution and obj[gen] = 5.00, and the tolerance_counter = 4
        solution chromosome =
114
115
          first level: [ [2. 8.]
116
          second level: [0. 1.]
          third level: [2, 6,]]
117
118
        The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121
        obj[gen-1] = 5.00 temp_best_value_gen = 5.00
        No, maintain solution and obj[gen] = 5.00, and the tolerance_counter = 5
122
123
        solution chromosome =
124
          first level: [ [2. 8.]
125
          second level: [0.1.]
126
          third level: [2. 6.]]
127
        The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130
        obj[gen-1] = 5.00 temp_best_value_gen = 5.00
131
        No, maintain solution and obj[gen] = 5.00, and the tolerance_counter = 6
132
        solution chromosome =
133
          first level: [ [2. 8.]
134
          second level: [0. 1.]
135
          third level: [2. 6.]]
136
        The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
        obj[gen-1] = 5.00 temp_best_value_gen = 5.00
140
        No, maintain solution and obj[gen] = 5.00, and the tolerance_counter = 7
141
        solution chromosome =
142
          first level: [ [2. 8.]
143
          second level: [0.1.]
          third level: [2. 6.]]
144
145
        The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
        obj[gen-1] = 5.00 temp_best_value_gen = 5.00
148
149
        No, maintain solution and obj[gen] = 5.00, and the tolerance_counter = 8
150
        solution chromosome =
151
          first level: [ [2. 8.]
152
          second level: [0. 1.]
153
          third level: [2. 6.]]
154
       The No. 13 iteration is finished!
155
156
157
158 The iteration is terminated and then visulize the solution:
159
        solution chromosome =
160
          first level: [ [2. 8.]
          second level: [0, 1,]
161
162
          third level: [2. 6.]]
        Objective function values and some other indicators:
163
```

| 1 | Obj0 = 3.00 $Obj1 = 1.00$ | Obj0 + Obj1 = 4.00 | | | |
|--------|---|---------------------------------------|--------------------|------------------------------------|--------------|
| 5 | Total movement of crane: 0.00 | | | | |
| 5 | Total waiting time in berth position: 1.00 | | | | |
| 7 } | Total index of q during berthing: 43.00 Specific arrangement for each vessel: | | | | |
|) | V_id: 0 li: 4.0 | ki: 2.0 bow of i: 0.0 | tail of i: 4.0 | gama_i0: 0.0 | gama_i1: 4.0 |
| | duration time i: 4.0 | demand i: 160.0 | work load i: 160.0 | work load gap i: 0 | |
|) | V_id: 1 li: 8.0 | ki: 8.0 bow of i: 4.0 demand_i: 120.0 | tail of i: 12.0 | gama_i0: 1.0 work load gap_i: 0 | gama_i1: 2. |
| | duration_time_i: 1.0 | demand_1: 120.0 | work load_i: 120.0 | work load gap_1: 0 | |
| . 1 | Algorithm finished and the total CPU time: 11 | 2 s | | | |
| . I | End | | | | |
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