```
exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=15123
2
3
   import sys; print('Python %s on %s' % (sys.version, sys.platform))
   01_My_Python_Code'])
5
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.
12
13
  This is the R_8_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 = 58
21
       Pop_size = 30
       Tolerance iteration unchanged number = 10
23
       Chrom\_size = 24
       Iter_num_GA = 300
24
25
       Select_rate = 0.85
26
       Crossover rate = 0.95
       Mutation rate = 0.95
27
28
       Mu_oper_type = 1
29
       vessel\_move\_way = 2
30
       coefficient for Obj1= 1.9
       coefficient for Obj2= 0.100000000000000009
31
32
33
   Iteration begin:
34
35
   Beging the No. 0 iteration:
     obj[0] = 16.70 temp_best_value_gen = 16.70
36
     The No. 0 iteration is finished!
37
38
39
   Beging the No. 1 iteration:
     obj[gen-1] = 16.70 temp_best_value_gen = 16.70
40
     No, maintain solution and obj[gen] = 16.70, and the tolerance_counter = 1
41
42
     solution chromosome =
43
       first level: [ [26. 6.5 12. 16.5 20.5 25. 4. 2. ]
       second level: [1. 0. 0. 0. 1. 4. 2. 6.]
44
45
       third level: [3. 4. 4. 2. 3. 2. 2. 4.]]
46
     The No. 1 iteration is finished!
47
48
   Beging the No. 2 iteration:
     obj[gen-1] = 16.70 temp_best_value_gen = 16.10
49
50
     Yes, update solution and obj[gen] = 16.10
51
     solution chromosome =
       first level: [ [16.5 6.5 12. 26. 20.5 25. 4. 2. ]
52
53
       second level: [0. 0. 0. 1. 1. 4. 2. 6.]
54
       third level: [2. 4. 4. 3. 3. 2. 2. 4.]]
55
     The No. 2 iteration is finished!
56
57
   Beging the No. 3 iteration:
58
     obi[gen-1] = 16.10 temp best value gen = 14.00
     Yes, update solution and obj[gen] = 14.00
59
60
     solution chromosome =
       first level: [ [16.5 6.5 12. 26. 20.5 3. 4. 25. ]
61
62
       second level: [0. 0. 0. 1. 1. 2. 4. 4.]
       third level: [2. 4. 4. 3. 3. 4. 6. 2.]]
63
     The No. 3 iteration is finished!
64
65
   Beging the No. 4 iteration:
66
67
     obj[gen-1] = 14.00 temp_best_value_gen = 14.00
68
     No, maintain solution and obj[gen] = 14.00, and the tolerance_counter = 1
69
     solution chromosome =
70
       first level: [ [16.5 6.5 12. 26. 20.5 3. 4. 25. ]
       second level: [0. 0. 0. 1. 1. 2. 4. 4.]
71
       third level: [2. 4. 4. 3. 3. 4. 6. 2.]]
73
     The No. 4 iteration is finished!
74
75
   Beging the No. 5 iteration:
     obi[gen-1] = 14.00 temp best value gen = 14.00
76
     No, maintain solution and obj[gen] = 14.00, and the tolerance_counter = 2
77
78
     solution chromosome =
       first level: [ [16.5 6.5 12. 26. 20.5 3. 4. 25. ]
```

```
second level: [0. 0. 0. 1. 1. 2. 4. 4.]
 80
          third level: [2. 4. 4. 3. 3. 4. 6. 2.]]
 81
 82
       The No. 5 iteration is finished!
 83
 84 Beging the No. 6 iteration:
 85
       obj[gen-1] = 14.00 temp best value gen = 14.00
       No, maintain solution and obj[gen] = 14.00, and the tolerance_counter = 3
 86
 87
        solution chromosome =
 88
          first level: [ [16.5 6.5 12. 26. 20.5 3. 4. 25. ]
 89
          second level: [0. 0. 0. 1. 1. 2. 4. 4.]
 90
          third level: [2. 4. 4. 3. 3. 4. 6. 2.]]
 91
       The No. 6 iteration is finished!
 92
 93 Beging the No. 7 iteration:
        obj[gen-1] = 14.00 temp_best_value_gen = 14.00
 94
 95
        No, maintain solution and obj[gen] = 14.00, and the tolerance_counter = 4
 96
       solution chromosome =
 97
          first level: [ [16.5 6.5 12. 26. 20.5 3. 4. 25. ]
 98
          second level: [0. 0. 0. 1. 1. 2. 4. 4.]
 99
          third level: [2. 4. 4. 3. 3. 4. 6. 2.]]
100
       The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
       obj[gen-1] = 14.00 temp best value gen = 14.00
103
104
       No, maintain solution and obj[gen] = 14.00, and the tolerance_counter = 5
105
        solution chromosome =
          first level: [ [16.5 6.5 12. 26. 20.5 3. 4. 25. ]
106
107
          second level: [0. 0. 0. 1. 1. 2. 4. 4.]
108
          third level: [2. 4. 4. 3. 3. 4. 6. 2.]]
109
       The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112
        obj[gen-1] = 14.00 temp\_best\_value\_gen = 14.00
113
       No, maintain solution and obj[gen] = 14.00, and the tolerance_counter = 6
       solution chromosome =
114
          first level: [ [16.5 6.5 12. 26. 20.5 3. 4. 25. ]
115
116
          second level: [0. 0. 0. 1. 1. 2. 4. 4.]
          third level: [2. 4. 4. 3. 3. 4. 6. 2.]]
117
       The No. 9 iteration is finished!
118
119
120 Beging the No. 10 iteration:
       obj[gen-1] = 14.00 temp_best_value_gen = 14.00
121
122
       No, maintain solution and obj[gen] = 14.00, and the tolerance_counter = 7
123
        solution chromosome =
124
          first level: [ [16.5 6.5 12. 26. 20.5 3. 4. 25. ]
125
          second level: [0. 0. 0. 1. 1. 2. 4. 4.]
126
          third level: [2. 4. 4. 3. 3. 4. 6. 2.]]
127
       The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
        obj[gen-1] = 14.00 temp_best_value_gen = 14.00
130
131
       No, maintain solution and obj[gen] = 14.00, and the tolerance_counter = 8
132
       solution chromosome =
133
          first level: [ [16.5 6.5 12. 26. 20.5 3. 4. 25. ]
134
          second level: [0. 0. 0. 1. 1. 2. 4. 4.]
135
          third level: [2. 4. 4. 3. 3. 4. 6. 2.]]
136
       The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139
       obj[gen-1] = 14.00 temp_best_value_gen = 14.00
140
       No, maintain solution and obj[gen] = 14.00, and the tolerance_counter = 9
141
        solution chromosome =
142
          first level: [ [16.5 6.5 12. 26. 20.5 3. 4. 25. ]
143
          second level: [0. 0. 0. 1. 1. 2. 4. 4.]
          third level: [2. 4. 4. 3. 3. 4. 6. 2.]]
144
145
       The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
        obj[gen-1] = 14.00 temp_best_value_gen = 14.00
148
149
       No, maintain solution and obj[gen] = 14.00, and the tolerance_counter = 10
150
       solution chromosome =
151
          first level: [ [16.5 6.5 12. 26. 20.5 3. 4. 25. ]
152
          second level: [0. 0. 0. 1. 1. 2. 4. 4.]
153
          third level: [2. 4. 4. 3. 3. 4. 6. 2.]]
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: [ [16.5 6.5 12. 26. 20.5 3. 4. 25. ]
          second level: [0. 0. 0. 1. 1. 2. 4. 4.]
161
162
          third level: [2. 4. 4. 3. 3. 4. 6. 2.]]
        Objective function values and some other indicators:
163
```

ulikii	OWII						
164	Obj0 = 5.	Obj $1 = 45.00$	Obj0 + Oł	oj1 = 50.00			
165	Total movement of crane: 33.00						
166	Total waiting time in berth position: 12.00						
167	Total index of q during berthing: 555.00						
168							
169					5.0 tail of i: 18.0		gama_i1: 4
	.0	duration_time_i: 4.0	demand	∟i: 160.0	work load_i: 160.0 tail of i: 10.0	work load gap_i: 0	
170	V_id: 1	li: 7.0	xi: 6.5	bow of i: 3.0	tail of i: 10.0	gama_i0: 0.0	gama_i1: 2.0
		duration_time_i: 2.0	demand_i:	: 100.0	work load_i: 100.0	work load gap_i: 0	
171	V_id: 2	li: 4.0	xi: 12.0	bow of i: 10	0.0 tail of i: 14.0	gama_i0: 0.0	gama_i1: 1
	.0	duration_time_i: 1.0	demand	∟i: 80.0	work load_i: 80.0	work load gap_i: 0	
172	V_id: 3	li: 5.0			3.5 tail of i: 28.5		gama_i1: 3
		duration_time_i: 2.0	demand		work load_i: 100.0		
173		1i: 3.0	xi: 20.5		9.0 tail of i: 22.0		gama_i1: 4
		duration_time_i: 3.0	demand	∟i: 160.0	work load_i: 160.0		
174		li: 6.0				gama_i0: 2.0	gama_i1: 4.0
		duration_time_i: 2.0	demand_i:	: 100.0	work load_i: 100.0	work load gap_i: 0	
175	V id: 6	li: 8.0	xi: 4.0	bow of i: 0.0	tail of i: 8.0	gama i0: 4.0	gama_i1: 6.0
		duration_time_i: 2.0	demand_i	: 160.0	work load_i: 160.0 3.0 tail of i: 27.0	work load gap_i: 0	
176	V_id: 7	li: 4.0	xi: 25.0	bow of i: 2.	3.0 tail of i: 27.0	gama_i0: 4.0	gama_i1: 6
	.0	duration_time_i: 2.0	demand	∟i: 80.0	work load_i: 80.0	work load gap_i: 0	
177							
	Algorithm finished and the total CPU time: 1163 s						
	End						
180							
1							