1 "E:\1 □□□□\3 □□□□□\1 □□□□□□□\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=34885

2

3 import sys; print('Python %s on %s' % (sys.version, sys.platform))

4 sys.path.extend(['E:\\1 □□□□\\3 □□□□□\\1 □□□□□□□\\1 □□□□□□□□\\1_□□□□□□_□□□□\\1_LW_□□□□2\\6 □□□□\\2 python code\\01_My_Python_Code', 'E:/1 □□□□/3 □□□□□/1 □□□□□□□/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_□□□□□□_□□□□/1_LW_□□□□2/6 □□□□/2 python code/01_My_Python_Code/main_BACASP_official_ENSGA-II.py', wdir='E:/1 □□□□/3 □□□□□/1 □□□□□□□/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_20_1 _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      $Chrom\_size = 60$

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    $obj[0] = 170.18$ $temp\_best\_value\_gen = 170.18$

37   The No. 0 iteration is finished!

38

39 Beging the No. 1 iteration:

40    $obj[gen-1] = 170.18$ $temp\_best\_value\_gen = 170.18$

41   No, maintain solution and $obj[gen] = 170.18$, and the $tolerance\_counter = 1$

42   solution chromosome =

43   first level: [[4.51 3.98 6.79 7.72 5.07 2.86 4.21 4.35 2.98 4.22 7.12 7.88

44 4.64 6.05 4.45 4.59 8.5 4. 13.5 16.5]

45   second level: [8. 2. 5. 4. 1. 11. 14. 16. 20. 23. 25. 26. 28. 29. 31. 33. 2. 0.

46 1. 3.]

47   third level: [2. 2. 2. 3. 4. 2. 7. 2. 3. 3. 5. 5. 7. 7. 3. 2. 4. 3. 7. 3.]]

48   The No. 1 iteration is finished!

49

50 Beging the No. 2 iteration:

51    $obj[gen-1] = 170.18$ $temp\_best\_value\_gen = 170.18$

52   No, maintain solution and $obj[gen] = 170.18$, and the $tolerance\_counter = 2$

53   solution chromosome =

54   first level: [[4.51 3.98 6.79 7.72 5.07 2.86 4.21 4.35 2.98 4.22 7.12 7.88

55 4.64 6.05 4.45 4.59 8.5 4. 13.5 16.5]

56   second level: [8. 2. 5. 4. 1. 11. 14. 16. 20. 23. 25. 26. 28. 29. 31. 33. 2. 0.

57 1. 3.]

58   third level: [2. 2. 2. 3. 4. 2. 7. 2. 3. 3. 5. 5. 7. 7. 3. 2. 4. 3. 7. 3.]]

59   The No. 2 iteration is finished!

60

61 Beging the No. 3 iteration:

62    $obj[gen-1] = 170.18$ $temp\_best\_value\_gen = 141.34$

63   Yes, update solution and $obj[gen] = 141.34$

64   solution chromosome =

65   first level: [[4.51 3.98 6.79 7.12 5.07 2.86 4.21 4.35 2.98 4.22 7.72 7.88

66 4.64 6.05 4.45 16. 8.5 4. 13.5 16.5]

67   second level: [8. 2. 5. 25. 1. 11. 14. 16. 20. 23. 26. 28. 4. 30. 32. 3. 2. 0.

68 1. 6.]

69   third level: [2. 2. 2. 5. 4. 2. 7. 2. 3. 3. 5. 7. 7. 3. 2. 4. 3. 7. 3.]]

70   The No. 3 iteration is finished!

71

72 Beging the No. 4 iteration:

73    $obj[gen-1] = 141.34$ $temp\_best\_value\_gen = 141.34$

74   No, maintain solution and $obj[gen] = 141.34$, and the $tolerance\_counter = 1$

75   solution chromosome =

76   first level: [[4.51 3.98 6.79 7.12 5.07 2.86 4.21 4.35 2.98 4.22 7.72 7.88

77 4.64 6.05 4.45 16. 8.5 4. 13.5 16.5]

78   second level: [8. 2. 5. 25. 1. 11. 14. 16. 20. 23. 26. 28. 4. 30. 32. 3. 2. 0.

79 1. 6.]

```
80        third level:  [2. 2. 2. 5. 4. 2. 7. 2. 3. 3. 3. 5. 7. 7. 3. 2. 4. 3. 7. 3.] ]
81     The No. 4  iteration is finished!
82
83  Beging the No. 5  iteration:
84     obj[gen-1] = 141.34     temp_best_value_gen = 141.34
85     No, maintain solution  and obj[gen] = 141.34 , and the tolerance_counter = 2
86     solution chromosome =
87        first level: [ [ 4.51  3.98  6.79  7.12  5.07  2.86  4.21  4.35  2.98  4.22  7.72  7.88
88   4.64  6.05  4.45 16.    8.5  4.   13.5  16.5 ]
89        second level:  [ 8.  2.  5. 25.  1. 11. 14. 16. 20. 23. 26. 28.  4. 30. 32.  3.  2.  0.
90    1.  6.]
91        third level:  [2. 2. 2. 5. 4. 2. 7. 2. 3. 3. 3. 5. 7. 7. 3. 2. 4. 3. 7. 3.] ]
92     The No. 5  iteration is finished!
93
94  Beging the No. 6  iteration:
95     obj[gen-1] = 141.34     temp_best_value_gen = 141.34
96     No, maintain solution  and obj[gen] = 141.34 , and the tolerance_counter = 3
97     solution chromosome =
98        first level: [ [ 4.51  3.98  6.79  7.12  5.07  2.86  4.21  4.35  2.98  4.22  7.72  7.88
99   4.64  6.05  4.45 16.    8.5  4.   13.5  16.5 ]
100        second level:  [ 8.  2.  5. 25.  1. 11. 14. 16. 20. 23. 26. 28.  4. 30. 32.  3.  2.  0.
101    1.  6.]
102        third level:  [2. 2. 2. 5. 4. 2. 7. 2. 3. 3. 3. 5. 7. 7. 3. 2. 4. 3. 7. 3.] ]
103     The No. 6  iteration is finished!
104
105
106  --------------------------------------------------------------------------------------
107  The iteration is terminated and then visulize the solution:
108     solution chromosome =
109        first level: [ [ 4.51  3.98  6.79  7.12  5.07  2.86  4.21  4.35  2.98  4.22  7.72  7.88
110   4.64  6.05  4.45 16.    8.5  4.   13.5  16.5 ]
111        second level:  [ 8.  2.  5. 25.  1. 11. 14. 16. 20. 23. 26. 28.  4. 30. 32.  3.  2.  0.
112    1.  6.]
113        third level:  [2. 2. 2. 5. 4. 2. 7. 2. 3. 3. 3. 5. 7. 7. 3. 2. 4. 3. 7. 3.] ]
114     Objective function values and some other indicators:
115        Obj0 = 33.00          Obj1 = 786.38          Obj0 + Obj1 = 819.38
116        Total movement of crane: 54.38
117        Total waiting time in berth position: 257.00
118        Total index of q during berthing: 436.00
119     Specific arrangement for each vessel:
```

120	V_id: 0	li: 9.0	xi: 4.5	bow of i: 0.0	tail of i: 9.0	gama_i0: 8.0	gama_i1: 10.0
		duration_time_i: 2.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0	
121	V_id: 1	li: 4.0	xi: 4.0	bow of i: 2.0	tail of i: 6.0	gama_i0: 2.0	gama_i1: 4.0
		duration_time_i: 2.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0	
122	V_id: 2	li: 9.0	xi: 6.8	bow of i: 2.3	tail of i: 11.3	gama_i0: 5.0	gama_i1: 8.0
		duration_time_i: 3.0	demand_i: 120.0	work load_i: 120.0	work load gap_i: 0	
123	V_id: 3	li: 8.0	xi: 7.1	bow of i: 3.1	tail of i: 11.1	gama_i0: 25.0	gama_i1: 26.0
		duration_time_i: 1.0	demand_i: 60.0	work load_i: 60.0	work load gap_i: 0	
124	V_id: 4	li: 4.0	xi: 5.1	bow of i: 3.1	tail of i: 7.1	gama_i0: 1.0	gama_i1: 2.0
		duration_time_i: 1.0	demand_i: 60.0	work load_i: 60.0	work load gap_i: 0	
125	V_id: 5	li: 4.0	xi: 2.9	bow of i: 0.9	tail of i: 4.9	gama_i0: 11.0	gama_i1: 14.0
		duration_time_i: 3.0	demand_i: 100.0	work load_i: 100.0	work load gap_i: 0	
126	V_id: 6	li: 8.0	xi: 4.2	bow of i: 0.2	tail of i: 8.2	gama_i0: 14.0	gama_i1: 16.0
		duration_time_i: 2.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0	
127	V_id: 7	li: 7.0	xi: 4.3	bow of i: 0.8	tail of i: 7.8	gama_i0: 16.0	gama_i1: 20.0
		duration_time_i: 4.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0	
128	V_id: 8	li: 3.0	xi: 3.0	bow of i: 1.5	tail of i: 4.5	gama_i0: 20.0	gama_i1: 23.0
		duration_time_i: 3.0	demand_i: 140.0	work load_i: 140.0	work load gap_i: 0	
129	V_id: 9	li: 5.0	xi: 4.2	bow of i: 1.7	tail of i: 6.7	gama_i0: 23.0	gama_i1: 25.0
		duration_time_i: 2.0	demand_i: 100.0	work load_i: 100.0	work load gap_i: 0	
130	V_id: 10	li: 9.0	xi: 7.7	bow of i: 3.2	tail of i: 12.2	gama_i0: 26.0	gama_i1: 28.0
		duration_time_i: 2.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0	
131	V_id: 11	li: 9.0	xi: 7.9	bow of i: 3.4	tail of i: 12.4	gama_i0: 28.0	gama_i1: 30.0
		duration_time_i: 2.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0	
132	V_id: 12	li: 8.0	xi: 4.6	bow of i: 0.6	tail of i: 8.6	gama_i0: 4.0	gama_i1: 5.0
		duration_time_i: 1.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0	
133	V_id: 13	li: 8.0	xi: 6.0	bow of i: 2.0	tail of i: 10.0	gama_i0: 30.0	gama_i1: 32.0
		duration_time_i: 2.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0	
134	V_id: 14	li: 5.0	xi: 4.5	bow of i: 2.0	tail of i: 7.0	gama_i0: 32.0	gama_i1: 34.0
		duration_time_i: 2.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0	
135	V_id: 15	li: 9.0	xi: 16.0	bow of i: 11.5	tail of i: 20.5	gama_i0: 3.0	gama_i1: 6.0
		duration_time_i: 3.0	demand_i: 120.0	work load_i: 120.0	work load gap_i: 0	
136	V_id: 16	li: 5.0	xi: 8.5	bow of i: 6.0	tail of i: 11.0	gama_i0: 2.0	gama_i1: 4.0
		duration_time_i: 2.0	demand_i: 120.0	work load_i: 120.0	work load gap_i: 0	
137	V_id: 17	li: 7.0	xi: 4.0	bow of i: 0.5	tail of i: 7.5	gama_i0: 0.0	gama_i1: 1.0
		duration_time_i: 1.0	demand_i: 60.0	work load_i: 60.0	work load gap_i: 0	
138	V_id: 18	li: 7.0	xi: 13.5	bow of i: 10.0	tail of i: 17.0	gama_i0: 1.0	gama_i1: 2.0
		duration_time_i: 1.0	demand_i: 60.0	work load_i: 60.0	work load gap_i: 0	
139	V_id: 19	li: 9.0	xi: 16.5	bow of i: 12.0	tail of i: 21.0	gama_i0: 6.0	gama_i1: 9.0
		duration_time_i: 3.0	demand_i: 140.0	work load_i: 140.0	work load gap_i: 0	

```
140
141  Algorithm finished and the total CPU time: 1364 s
142  End
143
```