```
"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=10187

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

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
>>> runfile('E:/1 □□□□/3 □□□□□/1 □□□□□□□/1 □□□□□□□□□/1_□□□□□□_□□□□/1_LW_□□□□2/6 □□□□/2 python code/01_My_Python_Code/main_BACASP_offical_PSO_2D_Bin_berth_line.py', wdir='E:/1 □□□□/3 □□□□□/1 □□□□□□□/1 □□□□□□□□□/1_□□□□□□_□□□□/1_LW_□□□□2/6 □□□□/2 python code/01_My_Python_Code')
Backend TkAgg is interactive backend. Turning interactive mode on.
Waiting 1s.....

This is the  R_6_1 _standerd_test.xlsx  optimization process.

Start
    Read basic data
        V =  6
        T =  36
        Q =  23
        L =  30
    PSO parameter setting:
        Trail =  29
        maxIter_num =  10
        W_inertia =  1.0
        oder_type_num =  10
        c1 =  2.0
        c2 =  1.0
        r1 =  0.3239655105992907
        r2 =  0.3239655105992907
Begin iteration:

iter =  0
        cord_individul_obj[indivial_i, :] =  [  0.   4. 106. 110.]
        cord_individul_obj[indivial_i, :] =  [  1.   4. 108. 112.]
        cord_individul_obj[indivial_i, :] =  [ 2.  6. 34. 40.]
        cord_individul_obj[indivial_i, :] =  [ 3.  6. 84. 90.]
        cord_individul_obj[indivial_i, :] =  [ 4.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 5.  4. 22. 26.]
        cord_individul_obj[indivial_i, :] =  [ 6.  3. 80. 83.]
        cord_individul_obj[indivial_i, :] =  [ 7.  4. 56. 60.]
        cord_individul_obj[indivial_i, :] =  [ 8.  5. 82. 87.]
        cord_individul_obj[indivial_i, :] =  [ 9.  5. 60. 65.]

    min(cord_individul_obj[:, 3]) =  12.0
    historl_G_best_iter[iter, 3] =  12.0
Begin iteration:

iter =  1
        cord_individul_obj[indivial_i, :] =  [ 0.  4. 68. 72.]
        cord_individul_obj[indivial_i, :] =  [ 1.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 2.  4. 18. 22.]
        cord_individul_obj[indivial_i, :] =  [ 3.  6. 60. 66.]
        cord_individul_obj[indivial_i, :] =  [ 4.  4. 32. 36.]
        cord_individul_obj[indivial_i, :] =  [ 5.  4. 28. 32.]
        cord_individul_obj[indivial_i, :] =  [ 6.  4. 44. 48.]
        cord_individul_obj[indivial_i, :] =  [ 7.  6. 60. 66.]
        cord_individul_obj[indivial_i, :] =  [ 8.  5. 18. 23.]
        cord_individul_obj[indivial_i, :] =  [ 9.  5. 48. 53.]

    min(cord_individul_obj[:, 3]) =  12.0
    historl_G_best_iter[iter, 3] =  12.0
Begin iteration:

iter =  2
        cord_individul_obj[indivial_i, :] =  [ 0.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 1.  4. 58. 62.]
        cord_individul_obj[indivial_i, :] =  [ 2.  6. 16. 22.]
        cord_individul_obj[indivial_i, :] =  [ 3.  6. 80. 86.]
        cord_individul_obj[indivial_i, :] =  [ 4.  5. 12. 17.]
        cord_individul_obj[indivial_i, :] =  [ 5.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 6.  6. 56. 62.]
        cord_individul_obj[indivial_i, :] =  [  7.   4. 140. 144.]
        cord_individul_obj[indivial_i, :] =  [ 8.  4. 52. 56.]
        cord_individul_obj[indivial_i, :] =  [ 9.  5. 52. 57.]

    min(cord_individul_obj[:, 3]) =  12.0
    historl_G_best_iter[iter, 3] =  12.0
Begin iteration:

```

```
iter =  3
        cord_individul_obj[indivial_i, :] =  [ 0.  4. 12. 16.]
        cord_individul_obj[indivial_i, :] =  [ 1.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 2.  6. 12. 18.]
        cord_individul_obj[indivial_i, :] =  [ 3.  6. 44. 50.]
        cord_individul_obj[indivial_i, :] =  [ 4.  5. 16. 21.]
        cord_individul_obj[indivial_i, :] =  [ 5.  4. 24. 28.]
        cord_individul_obj[indivial_i, :] =  [ 6.  6. 72. 78.]
        cord_individul_obj[indivial_i, :] =  [ 7.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 8.  4. 76. 80.]
        cord_individul_obj[indivial_i, :] =  [ 9.  5. 44. 49.]

    min(cord_individul_obj[:, 3]) =  12.0
    historl_G_best_iter[iter, 3] =  12.0
Begin iteration:

iter =  4
        cord_individul_obj[indivial_i, :] =  [ 0.  4. 12. 16.]
        cord_individul_obj[indivial_i, :] =  [ 1.  4. 12. 16.]
        cord_individul_obj[indivial_i, :] =  [ 2.  6. 16. 22.]
        cord_individul_obj[indivial_i, :] =  [ 3.  4. 82. 86.]
        cord_individul_obj[indivial_i, :] =  [ 4.  5. 30. 35.]
        cord_individul_obj[indivial_i, :] =  [ 5.  4. 12. 16.]
        cord_individul_obj[indivial_i, :] =  [ 6.  6. 44. 50.]
        cord_individul_obj[indivial_i, :] =  [ 7.  6. 44. 50.]
        cord_individul_obj[indivial_i, :] =  [ 8.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 9.  4. 30. 34.]

    min(cord_individul_obj[:, 3]) =  12.0
    historl_G_best_iter[iter, 3] =  12.0
Begin iteration:

iter =  5
        cord_individul_obj[indivial_i, :] =  [ 0.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 1.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 2.  6. 52. 58.]
        cord_individul_obj[indivial_i, :] =  [ 3.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 4.  5. 12. 17.]
        cord_individul_obj[indivial_i, :] =  [ 5.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 6.  6. 44. 50.]
        cord_individul_obj[indivial_i, :] =  [ 7.  6. 12. 18.]
        cord_individul_obj[indivial_i, :] =  [ 8.  4. 48. 52.]
        cord_individul_obj[indivial_i, :] =  [ 9.  4. 12. 16.]

    min(cord_individul_obj[:, 3]) =  12.0
    historl_G_best_iter[iter, 3] =  12.0
Begin iteration:

iter =  6
        cord_individul_obj[indivial_i, :] =  [ 0.  5. 18. 23.]
        cord_individul_obj[indivial_i, :] =  [ 1.  4. 34. 38.]
        cord_individul_obj[indivial_i, :] =  [ 2.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 3.  4. 12. 16.]
        cord_individul_obj[indivial_i, :] =  [ 4.  5. 18. 23.]
        cord_individul_obj[indivial_i, :] =  [ 5.  4. 18. 22.]
        cord_individul_obj[indivial_i, :] =  [ 6.  6. 12. 18.]
        cord_individul_obj[indivial_i, :] =  [ 7.  4. 12. 16.]
        cord_individul_obj[indivial_i, :] =  [ 8.  4. 18. 22.]
        cord_individul_obj[indivial_i, :] =  [ 9.  4. 24. 28.]

    min(cord_individul_obj[:, 3]) =  12.0
    historl_G_best_iter[iter, 3] =  12.0
Begin iteration:

iter =  7
        cord_individul_obj[indivial_i, :] =  [ 0.  5. 18. 23.]
        cord_individul_obj[indivial_i, :] =  [ 1.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 2.  6.  8. 14.]
        cord_individul_obj[indivial_i, :] =  [ 3.  4. 24. 28.]
        cord_individul_obj[indivial_i, :] =  [ 4.  5. 18. 23.]
        cord_individul_obj[indivial_i, :] =  [ 5.  4. 18. 22.]
        cord_individul_obj[indivial_i, :] =  [ 6.  6.  8. 14.]
        cord_individul_obj[indivial_i, :] =  [ 7.  6.  8. 14.]
        cord_individul_obj[indivial_i, :] =  [ 8.  4. 18. 22.]
        cord_individul_obj[indivial_i, :] =  [ 9.  4. 18. 22.]

    min(cord_individul_obj[:, 3]) =  12.0
    historl_G_best_iter[iter, 3] =  12.0
Begin iteration:

iter =  8
        cord_individul_obj[indivial_i, :] =  [ 0.  5.  8. 13.]
        cord_individul_obj[indivial_i, :] =  [ 1.  4. 34. 38.]
        cord_individul_obj[indivial_i, :] =  [ 2.  6. 18. 24.]
```

```
        cord_individul_obj[indivial_i, :] =  [ 3.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 4.  4. 18. 22.]
        cord_individul_obj[indivial_i, :] =  [ 5.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 6.  6.  8. 14.]
        cord_individul_obj[indivial_i, :] =  [ 7.  3. 58. 61.]
        cord_individul_obj[indivial_i, :] =  [ 8.  4. 18. 22.]
        cord_individul_obj[indivial_i, :] =  [ 9.  4. 24. 28.]

    min(cord_individul_obj[:, 3]) =  12.0
    historl_G_best_iter[iter, 3] =  12.0
Begin iteration:

iter =  9
        cord_individul_obj[indivial_i, :] =  [ 0.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 1.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 2.  6. 12. 18.]
        cord_individul_obj[indivial_i, :] =  [ 3.  4. 18. 22.]
        cord_individul_obj[indivial_i, :] =  [ 4.  4. 18. 22.]
        cord_individul_obj[indivial_i, :] =  [ 5.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 6.  4. 12. 16.]
        cord_individul_obj[indivial_i, :] =  [ 7.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 8.  4. 12. 16.]
        cord_individul_obj[indivial_i, :] =  [ 9.  4. 20. 24.]

    min(cord_individul_obj[:, 3]) =  12.0
    historl_G_best_iter[iter, 3] =  12.0
Begin iteration:

iter =  10
        cord_individul_obj[indivial_i, :] =  [ 0.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 1.  4. 18. 22.]
        cord_individul_obj[indivial_i, :] =  [ 2.  4. 14. 18.]
        cord_individul_obj[indivial_i, :] =  [ 3.  4. 24. 28.]
        cord_individul_obj[indivial_i, :] =  [ 4.  5. 56. 61.]
        cord_individul_obj[indivial_i, :] =  [ 5.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 6.  6.  8. 14.]
        cord_individul_obj[indivial_i, :] =  [ 7.  6. 16. 22.]
        cord_individul_obj[indivial_i, :] =  [ 8.  4. 28. 32.]
        cord_individul_obj[indivial_i, :] =  [ 9.  4.  8. 12.]

    min(cord_individul_obj[:, 3]) =  12.0
    historl_G_best_iter[iter, 3] =  12.0
Iteration calculate over




All item are in Bin and:
    Bin area =  1080
    Real_area =  95.0
    Proportion_of_area =  0.08796296296296297
        BEST_CHROM =
            berth:  [20.5 26.  10.  15.5  1.5  5. ]
            time:  [0. 0. 0. 0. 0. 0.]
            num_QC:  [2. 2. 3. 2. 2. 3.]
    Objective function values and some other indicators:
        Obj0 = 4.00             Obj1 = 8.00             Obj0 + Obj1 = 12.00
        Total movement of crane: 8.00
        Total waiting time in berth position: 0.00
        Total index of q during berthing: 408.00
    Specific arrangement for each vessel:
        V_id:  0            li: 5.0             xi: 20.5            bow of i: 18.0          tail of i: 23.0         gama_i0: 0.0            gama_i1: 1
    .0              gama_i1 + 1: 2.0            gama_i1 - gama_i0: 1.0          duration_time_i: 2.0        demand_i: 80.0          work
    load_i: 80.0            work load gap_i: 0
        V_id:  1            li: 6.0             xi: 26.0            bow of i: 23.0          tail of i: 29.0         gama_i0: 0.0            gama_i1: 2
    .0              gama_i1 + 1: 3.0            gama_i1 - gama_i0: 2.0          duration_time_i: 3.0        demand_i: 120.0         work
    load_i: 120.0           work load gap_i: 0
        V_id:  2            li: 6.0             xi: 10.0            bow of i: 7.0           tail of i: 13.0         gama_i0: 0.0            gama_i1: 4
    .0              gama_i1 + 1: 5.0            gama_i1 - gama_i0: 4.0          duration_time_i: 5.0        demand_i: 260.0         work
    load_i: 260.0           work load gap_i: 0
        V_id:  3            li: 5.0             xi: 15.5            bow of i: 13.0          tail of i: 18.0         gama_i0: 0.0            gama_i1: 1
    .0              gama_i1 + 1: 2.0            gama_i1 - gama_i0: 1.0          duration_time_i: 2.0        demand_i: 80.0          work
    load_i: 80.0            work load gap_i: 0
        V_id:  4            li: 3.0             xi: 1.5             bow of i: 0.0           tail of i: 3.0          gama_i0: 0.0            gama_i1: 4.0
                    gama_i1 + 1: 5.0            gama_i1 - gama_i0: 4.0          duration_time_i: 5.0        demand_i: 200.0             work load_i:
    200.0               work load gap_i: 0
        V_id:  5            li: 4.0             xi: 5.0             bow of i: 3.0           tail of i: 7.0          gama_i0: 0.0            gama_i1: 3.0
                    gama_i1 + 1: 4.0            gama_i1 - gama_i0: 3.0          duration_time_i: 4.0        demand_i: 220.0             work load_i:
    220.0               work load gap_i: 0

Algorithm finished and the total CPU time: 54 s
End
```