```
"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=11461

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 =  22
        maxIter_num =  10
        W_inertia =  2.0
        oder_type_num =  10
        c1 =  1.0
        c2 =  2.0
        r1 =  0.416539851575108
        r2 =  0.416539851575108
Begin iteration:

iter =  0
        cord_individul_obj[indivial_i, :] =  [ 0.  6. 78. 84.]
        cord_individul_obj[indivial_i, :] =  [  1.   3. 128. 131.]
        cord_individul_obj[indivial_i, :] =  [  2.   4. 100. 104.]
        cord_individul_obj[indivial_i, :] =  [  3.   6.  94. 100.]
        cord_individul_obj[indivial_i, :] =  [ 4.  6.  8. 14.]
        cord_individul_obj[indivial_i, :] =  [ 5.  3. 52. 55.]
        cord_individul_obj[indivial_i, :] =  [ 6.  3. 54. 57.]
        cord_individul_obj[indivial_i, :] =  [ 7.  4. 70. 74.]
        cord_individul_obj[indivial_i, :] =  [ 8.  6. 16. 22.]
        cord_individul_obj[indivial_i, :] =  [ 9.  6. 44. 50.]

    min(cord_individul_obj[:, 3]) =  14.0
    historl_G_best_iter[iter, 3] =  14.0
Begin iteration:

iter =  1
        cord_individul_obj[indivial_i, :] =  [ 0.  4. 30. 34.]
        cord_individul_obj[indivial_i, :] =  [ 1.  6.  8. 14.]
        cord_individul_obj[indivial_i, :] =  [ 2.  4. 52. 56.]
        cord_individul_obj[indivial_i, :] =  [ 3.  6. 12. 18.]
        cord_individul_obj[indivial_i, :] =  [ 4.  4. 20. 24.]
        cord_individul_obj[indivial_i, :] =  [  5.   6. 128. 134.]
        cord_individul_obj[indivial_i, :] =  [ 6.  3. 18. 21.]
        cord_individul_obj[indivial_i, :] =  [ 7.  6. 18. 24.]
        cord_individul_obj[indivial_i, :] =  [ 8.  4. 56. 60.]
        cord_individul_obj[indivial_i, :] =  [ 9.  6. 28. 34.]

    min(cord_individul_obj[:, 3]) =  14.0
    historl_G_best_iter[iter, 3] =  14.0
Begin iteration:

iter =  2
        cord_individul_obj[indivial_i, :] =  [ 0.  4. 76. 80.]
        cord_individul_obj[indivial_i, :] =  [  1.   4. 114. 118.]
        cord_individul_obj[indivial_i, :] =  [  2.   5. 108. 113.]
        cord_individul_obj[indivial_i, :] =  [ 3.  6. 68. 74.]
        cord_individul_obj[indivial_i, :] =  [ 4.  6. 14. 20.]
        cord_individul_obj[indivial_i, :] =  [ 5.  6.  8. 14.]
        cord_individul_obj[indivial_i, :] =  [ 6.  5. 38. 43.]
        cord_individul_obj[indivial_i, :] =  [ 7.  4. 46. 50.]
        cord_individul_obj[indivial_i, :] =  [ 8.  5. 40. 45.]
        cord_individul_obj[indivial_i, :] =  [ 9.  5.  8. 13.]

    min(cord_individul_obj[:, 3]) =  13.0
    historl_G_best_iter[iter, 3] =  13.0
Begin iteration:

```

```
iter =  3
        cord_individul_obj[indivial_i, :] =  [ 0.  6. 24. 30.]
        cord_individul_obj[indivial_i, :] =  [ 1.  5.  8. 13.]
        cord_individul_obj[indivial_i, :] =  [ 2.  6. 76. 82.]
        cord_individul_obj[indivial_i, :] =  [ 3.  6. 56. 62.]
        cord_individul_obj[indivial_i, :] =  [ 4.  4. 78. 82.]
        cord_individul_obj[indivial_i, :] =  [ 5.  6. 12. 18.]
        cord_individul_obj[indivial_i, :] =  [ 6.  6.  8. 14.]
        cord_individul_obj[indivial_i, :] =  [ 7.  4. 12. 16.]
        cord_individul_obj[indivial_i, :] =  [ 8.  4. 38. 42.]
        cord_individul_obj[indivial_i, :] =  [ 9.  5. 24. 29.]

    min(cord_individul_obj[:, 3]) =  13.0
    historl_G_best_iter[iter, 3] =  13.0
Begin iteration:

iter =  4
        cord_individul_obj[indivial_i, :] =  [ 0.  5. 44. 49.]
        cord_individul_obj[indivial_i, :] =  [ 1.  4. 48. 52.]
        cord_individul_obj[indivial_i, :] =  [ 2.  5.  8. 13.]
        cord_individul_obj[indivial_i, :] =  [ 3.  4. 74. 78.]
        cord_individul_obj[indivial_i, :] =  [ 4.  5. 80. 85.]
        cord_individul_obj[indivial_i, :] =  [  5.   5. 120. 125.]
        cord_individul_obj[indivial_i, :] =  [ 6.  5. 38. 43.]
        cord_individul_obj[indivial_i, :] =  [  7.   5. 104. 109.]
        cord_individul_obj[indivial_i, :] =  [ 8.  5. 44. 49.]
        cord_individul_obj[indivial_i, :] =  [ 9.  5. 24. 29.]

    min(cord_individul_obj[:, 3]) =  13.0
    historl_G_best_iter[iter, 3] =  13.0
Begin iteration:

iter =  5
        cord_individul_obj[indivial_i, :] =  [ 0.  4. 52. 56.]
        cord_individul_obj[indivial_i, :] =  [ 1.  4. 48. 52.]
        cord_individul_obj[indivial_i, :] =  [ 2.  4. 38. 42.]
        cord_individul_obj[indivial_i, :] =  [ 3.  3. 48. 51.]
        cord_individul_obj[indivial_i, :] =  [ 4.  5. 38. 43.]
        cord_individul_obj[indivial_i, :] =  [ 5.  5.  8. 13.]
        cord_individul_obj[indivial_i, :] =  [ 6.  3. 80. 83.]
        cord_individul_obj[indivial_i, :] =  [  7.   5. 108. 113.]
        cord_individul_obj[indivial_i, :] =  [ 8.  4. 48. 52.]
        cord_individul_obj[indivial_i, :] =  [ 9.  5. 24. 29.]

    min(cord_individul_obj[:, 3]) =  13.0
    historl_G_best_iter[iter, 3] =  13.0
Begin iteration:

iter =  6
        cord_individul_obj[indivial_i, :] =  [ 0.  5. 28. 33.]
        cord_individul_obj[indivial_i, :] =  [ 1.  4. 78. 82.]
        cord_individul_obj[indivial_i, :] =  [ 2.  5. 60. 65.]
        cord_individul_obj[indivial_i, :] =  [ 3.  5. 66. 71.]
        cord_individul_obj[indivial_i, :] =  [ 4.  5. 70. 75.]
        cord_individul_obj[indivial_i, :] =  [  5.   3. 116. 119.]
        cord_individul_obj[indivial_i, :] =  [ 6.  5. 34. 39.]
        cord_individul_obj[indivial_i, :] =  [ 7.  5.  8. 13.]
        cord_individul_obj[indivial_i, :] =  [ 8.  5. 72. 77.]
        cord_individul_obj[indivial_i, :] =  [ 9.  5. 24. 29.]

    min(cord_individul_obj[:, 3]) =  13.0
    historl_G_best_iter[iter, 3] =  13.0
Begin iteration:

iter =  7
        cord_individul_obj[indivial_i, :] =  [ 0.  4. 86. 90.]
        cord_individul_obj[indivial_i, :] =  [  1.   4. 100. 104.]
        cord_individul_obj[indivial_i, :] =  [ 2.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 3.  4. 50. 54.]
        cord_individul_obj[indivial_i, :] =  [ 4.  5. 24. 29.]
        cord_individul_obj[indivial_i, :] =  [ 5.  5.  8. 13.]
        cord_individul_obj[indivial_i, :] =  [ 6.  4. 30. 34.]
        cord_individul_obj[indivial_i, :] =  [ 7.  5. 44. 49.]
        cord_individul_obj[indivial_i, :] =  [  8.   4. 106. 110.]
        cord_individul_obj[indivial_i, :] =  [ 9.  5.  8. 13.]

    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.   4.  98. 102.]
        cord_individul_obj[indivial_i, :] =  [ 1.  5. 28. 33.]
        cord_individul_obj[indivial_i, :] =  [ 2.  4. 58. 62.]
```

```
        cord_individul_obj[indivial_i, :] =  [ 3.  5. 16. 21.]
        cord_individul_obj[indivial_i, :] =  [ 4.  5. 20. 25.]
        cord_individul_obj[indivial_i, :] =  [ 5.  3. 86. 89.]
        cord_individul_obj[indivial_i, :] =  [ 6.  4. 62. 66.]
        cord_individul_obj[indivial_i, :] =  [ 7.  5. 16. 21.]
        cord_individul_obj[indivial_i, :] =  [ 8.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 9.  5. 40. 45.]

    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.  6. 20. 26.]
        cord_individul_obj[indivial_i, :] =  [ 2.  6. 48. 54.]
        cord_individul_obj[indivial_i, :] =  [ 3.  5. 58. 63.]
        cord_individul_obj[indivial_i, :] =  [ 4.  6. 58. 64.]
        cord_individul_obj[indivial_i, :] =  [ 5.  4. 38. 42.]
        cord_individul_obj[indivial_i, :] =  [ 6.  3. 64. 67.]
        cord_individul_obj[indivial_i, :] =  [ 7.  4. 64. 68.]
        cord_individul_obj[indivial_i, :] =  [ 8.  6. 24. 30.]
        cord_individul_obj[indivial_i, :] =  [ 9.  6.  8. 14.]

    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. 32. 36.]
        cord_individul_obj[indivial_i, :] =  [ 1.  6. 28. 34.]
        cord_individul_obj[indivial_i, :] =  [ 2.  4. 38. 42.]
        cord_individul_obj[indivial_i, :] =  [ 3.  5. 34. 39.]
        cord_individul_obj[indivial_i, :] =  [ 4.  4. 24. 28.]
        cord_individul_obj[indivial_i, :] =  [ 5.  4. 16. 20.]
        cord_individul_obj[indivial_i, :] =  [ 6.  4. 58. 62.]
        cord_individul_obj[indivial_i, :] =  [ 7.  4.  8. 12.]
        cord_individul_obj[indivial_i, :] =  [ 8.  4. 24. 28.]
        cord_individul_obj[indivial_i, :] =  [ 9.  6. 12. 18.]

    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 =  106.0
    Proportion_of_area =  0.09814814814814815
        BEST_CHROM =
            berth:  [20.5 26.  11.   2.5  6.5 16. ]
            time:  [0. 0. 0. 0. 0. 0.]
            num_QC:  [3. 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: 541.00
    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: 11.0            bow of i: 8.0           tail of i: 14.0         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: 2.5             bow of i: 0.0           tail of i: 5.0          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: 6.5             bow of i: 5.0           tail of i: 8.0          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: 16.0            bow of i: 14.0          tail of i: 18.0         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: 36 s
End
```