


```

80     second level: [ 2. 5. 7. 3. 5. 7. 1. 9. 11. 14. 16. 18.]
81     third level: [3. 2. 8. 4. 3. 2. 5. 5. 2. 3. 5. 9.]]
82     The No. 5 iteration is finished!
83
84 Beging the No. 6 iteration:
85     obj[gen-1] = 54.70   temp_best_value_gen = 54.70
86     No, maintain solution and obj[gen] = 54.70 , and the tolerance_counter = 6
87     solution chromosome =
88         first level: [ [ 4.5 4. 21. 27. 27. 13. 3.5 3.5 3.5 2.5 3. 4.5]
89         second level: [ 2. 5. 7. 3. 5. 7. 1. 9. 11. 14. 16. 18.]
90         third level: [3. 2. 8. 4. 3. 2. 5. 5. 2. 3. 5. 9.]]
91     The No. 6 iteration is finished!
92
93 Beging the No. 7 iteration:
94     obj[gen-1] = 54.70   temp_best_value_gen = 54.70
95     No, maintain solution and obj[gen] = 54.70 , and the tolerance_counter = 7
96     solution chromosome =
97         first level: [ [ 4.5 4. 21. 27. 27. 13. 3.5 3.5 3.5 2.5 3. 4.5]
98         second level: [ 2. 5. 7. 3. 5. 7. 1. 9. 11. 14. 16. 18.]
99         third level: [3. 2. 8. 4. 3. 2. 5. 5. 2. 3. 5. 9.]]
100    The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
103     obj[gen-1] = 54.70   temp_best_value_gen = 54.70
104     No, maintain solution and obj[gen] = 54.70 , and the tolerance_counter = 8
105     solution chromosome =
106         first level: [ [ 4.5 4. 21. 27. 27. 13. 3.5 3.5 3.5 2.5 3. 4.5]
107         second level: [ 2. 5. 7. 3. 5. 7. 1. 9. 11. 14. 16. 18.]
108         third level: [3. 2. 8. 4. 3. 2. 5. 5. 2. 3. 5. 9.]]
109    The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112     obj[gen-1] = 54.70   temp_best_value_gen = 54.70
113     No, maintain solution and obj[gen] = 54.70 , and the tolerance_counter = 9
114     solution chromosome =
115         first level: [ [ 4.5 4. 21. 27. 27. 13. 3.5 3.5 3.5 2.5 3. 4.5]
116         second level: [ 2. 5. 7. 3. 5. 7. 1. 9. 11. 14. 16. 18.]
117         third level: [3. 2. 8. 4. 3. 2. 5. 5. 2. 3. 5. 9.]]
118    The No. 9 iteration is finished!
119
120
121 -----
122 The iteration is terminated and then visulize the solution:
123     solution chromosome =
124         first level: [ [ 4.5 4. 21. 27. 27. 13. 3.5 3.5 3.5 2.5 3. 4.5]
125         second level: [ 2. 5. 7. 3. 5. 7. 1. 9. 11. 14. 16. 18.]
126         third level: [3. 2. 8. 4. 3. 2. 5. 5. 2. 3. 5. 9.]]
127     Objective function values and some other indicators:
128         Obj0 = 18.00      Obj1 = 205.00      Obj0 + Obj1 = 223.00
129         Total movement of crane: 55.00
130         Total waiting time in berth position: 98.00
131         Total index of q during berthing: 428.00
132     Specific arrangement for each vessel:
133         V_id: 0          li: 9.0          xi: 4.5          bow of i: 0.0          tail of i: 9.0          gama_i0: 2.0          gama_i1: 5.0
134         duration_time_i: 3.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
135         V_id: 1          li: 8.0          xi: 4.0          bow of i: 0.0          tail of i: 8.0          gama_i0: 5.0          gama_i1: 9.0
136         duration_time_i: 4.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
137         V_id: 2          li: 8.0          xi: 21.0          bow of i: 17.0          tail of i: 25.0          gama_i0: 7.0          gama_i1: 8
138         duration_time_i: 1.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
139         V_id: 3          li: 4.0          xi: 27.0          bow of i: 25.0          tail of i: 29.0          gama_i0: 3.0          gama_i1: 4
140         duration_time_i: 1.0          demand_i: 60.0          work load_i: 60.0          work load gap_i: 0
141         V_id: 4          li: 6.0          xi: 27.0          bow of i: 24.0          tail of i: 30.0          gama_i0: 5.0          gama_i1: 7
142         duration_time_i: 2.0          demand_i: 100.0          work load_i: 100.0          work load gap_i: 0
143         V_id: 5          li: 5.0          xi: 13.0          bow of i: 10.5          tail of i: 15.5          gama_i0: 7.0          gama_i1:
144         duration_time_i: 3.0          demand_i: 100.0          work load_i: 100.0          work load gap_i: 0
145         V_id: 6          li: 7.0          xi: 3.5          bow of i: 0.0          tail of i: 7.0          gama_i0: 1.0          gama_i1: 2.0
146         duration_time_i: 1.0          demand_i: 100.0          work load_i: 100.0          work load gap_i: 0
147         V_id: 7          li: 7.0          xi: 3.5          bow of i: 0.0          tail of i: 7.0          gama_i0: 9.0          gama_i1: 11.0
148         duration_time_i: 2.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
149         V_id: 8          li: 7.0          xi: 3.5          bow of i: 0.0          tail of i: 7.0          gama_i0: 11.0          gama_i1: 14.0
150         duration_time_i: 3.0          demand_i: 100.0          work load_i: 100.0          work load gap_i: 0
151         V_id: 9          li: 5.0          xi: 2.5          bow of i: 0.0          tail of i: 5.0          gama_i0: 14.0          gama_i1: 16.0
152         duration_time_i: 2.0          demand_i: 80.0          work load_i: 80.0          work load gap_i: 0
153         V_id: 10         li: 6.0          xi: 3.0          bow of i: 0.0          tail of i: 6.0          gama_i0: 16.0          gama_i1: 18.
154         duration_time_i: 2.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
155         V_id: 11         li: 9.0          xi: 4.5          bow of i: 0.0          tail of i: 9.0          gama_i0: 18.0          gama_i1: 19.
156         duration_time_i: 1.0          demand_i: 100.0          work load_i: 100.0          work load gap_i: 0
157
158 Algorithm finished and the total CPU time: 1286 s
159 End
160

```