



```

80     second level: [ 4. 1. 2. 0. 6. 8. 3. 10. 12.]
81     third level: [2. 9. 5. 5. 4. 2. 5. 7. 2. ]
82     The No. 5 iteration is finished!
83
84     Beging the No. 6 iteration:
85     obj[gen-1] = 34.53   temp_best_value_gen = 34.53
86     No, maintain solution and obj[gen] = 34.53 , and the tolerance_counter = 6
87     solution chromosome =
88     first level: [ 2.32 6.2 4.22 2.7 6.87 2.31 3.08 3.91 4.57]
89     second level: [ 4. 1. 2. 0. 6. 8. 3. 10. 12.]
90     third level: [2. 9. 5. 5. 4. 2. 5. 7. 2. ]
91     The No. 6 iteration is finished!
92
93     Beging the No. 7 iteration:
94     obj[gen-1] = 34.53   temp_best_value_gen = 34.53
95     No, maintain solution and obj[gen] = 34.53 , and the tolerance_counter = 7
96     solution chromosome =
97     first level: [ 2.32 6.2 4.22 2.7 6.87 2.31 3.08 3.91 4.57]
98     second level: [ 4. 1. 2. 0. 6. 8. 3. 10. 12.]
99     third level: [2. 9. 5. 5. 4. 2. 5. 7. 2. ]
100    The No. 7 iteration is finished!
101
102    Beging the No. 8 iteration:
103    obj[gen-1] = 34.53   temp_best_value_gen = 34.53
104    No, maintain solution and obj[gen] = 34.53 , and the tolerance_counter = 8
105    solution chromosome =
106    first level: [ 2.32 6.2 4.22 2.7 6.87 2.31 3.08 3.91 4.57]
107    second level: [ 4. 1. 2. 0. 6. 8. 3. 10. 12.]
108    third level: [2. 9. 5. 5. 4. 2. 5. 7. 2. ]
109    The No. 8 iteration is finished!
110
111    Beging the No. 9 iteration:
112    obj[gen-1] = 34.53   temp_best_value_gen = 34.53
113    No, maintain solution and obj[gen] = 34.53 , and the tolerance_counter = 9
114    solution chromosome =
115    first level: [ 2.32 6.2 4.22 2.7 6.87 2.31 3.08 3.91 4.57]
116    second level: [ 4. 1. 2. 0. 6. 8. 3. 10. 12.]
117    third level: [2. 9. 5. 5. 4. 2. 5. 7. 2. ]
118    The No. 9 iteration is finished!
119
120    Beging the No. 10 iteration:
121    obj[gen-1] = 34.53   temp_best_value_gen = 34.53
122    No, maintain solution and obj[gen] = 34.53 , and the tolerance_counter = 10
123    solution chromosome =
124    first level: [ 2.32 6.2 4.22 2.7 6.87 2.31 3.08 3.91 4.57]
125    second level: [ 4. 1. 2. 0. 6. 8. 3. 10. 12.]
126    third level: [2. 9. 5. 5. 4. 2. 5. 7. 2. ]
127    The No. 10 iteration is finished!
128
129
130    -----
131    The iteration is terminated and then visulize the solution:
132    solution chromosome =
133    first level: [ 2.32 6.2 4.22 2.7 6.87 2.31 3.08 3.91 4.57]
134    second level: [ 4. 1. 2. 0. 6. 8. 3. 10. 12.]
135    third level: [2. 9. 5. 5. 4. 2. 5. 7. 2. ]
136    Objective function values and some other indicators:
137    Obj0 = 14.00      Obj1 = 79.26      Obj0 + Obj1 = 93.26
138    Total movement of crane: 33.26
139    Total waiting time in berth position: 46.00
140    Total index of q during berthing: 107.00
141    Specific arrangement for each vessel:
142    V_id: 0          li: 3.0          xi: 2.3          bow of i: 0.8          tail of i: 3.8          gama_i0: 4.0          gama_i1: 6.0
143          duration_time_i: 2.0          demand_i: 80.0          work load_i: 80.0          work load gap_i: 0
144    V_id: 1          li: 9.0          xi: 6.2          bow of i: 1.7          tail of i: 10.7          gama_i0: 1.0          gama_i1: 2.0
145          duration_time_i: 1.0          demand_i: 140.0          work load_i: 140.0          work load gap_i: 0
146    V_id: 2          li: 5.0          xi: 4.2          bow of i: 1.7          tail of i: 6.7          gama_i0: 2.0          gama_i1: 3.0
147          duration_time_i: 1.0          demand_i: 80.0          work load_i: 80.0          work load gap_i: 0
148    V_id: 3          li: 5.0          xi: 2.7          bow of i: 0.2          tail of i: 5.2          gama_i0: 0.0          gama_i1: 1.0
149          duration_time_i: 1.0          demand_i: 80.0          work load_i: 80.0          work load gap_i: 0
150    V_id: 4          li: 9.0          xi: 6.9          bow of i: 2.4          tail of i: 11.4          gama_i0: 6.0          gama_i1: 8.0
151          duration_time_i: 2.0          demand_i: 100.0          work load_i: 100.0          work load gap_i: 0
152    V_id: 5          li: 3.0          xi: 2.3          bow of i: 0.8          tail of i: 3.8          gama_i0: 8.0          gama_i1: 10.0
153          duration_time_i: 2.0          demand_i: 80.0          work load_i: 80.0          work load gap_i: 0
154    V_id: 6          li: 5.0          xi: 3.1          bow of i: 0.6          tail of i: 5.6          gama_i0: 3.0          gama_i1: 4.0
155          duration_time_i: 1.0          demand_i: 100.0          work load_i: 100.0          work load gap_i: 0
156    V_id: 7          li: 7.0          xi: 3.9          bow of i: 0.4          tail of i: 7.4          gama_i0: 10.0          gama_i1: 12.0
157          duration_time_i: 2.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
158    V_id: 8          li: 5.0          xi: 4.6          bow of i: 2.1          tail of i: 7.1          gama_i0: 12.0          gama_i1: 15.0
159          duration_time_i: 3.0          demand_i: 100.0          work load_i: 100.0          work load gap_i: 0
160
161    Algorithm finished and the total CPU time: 1035 s
162    End
163

```