


```

80 iter = 3
81   cord_individul_obj[indivial_i, :] = [ 0.  5. 32. 37.]
82   cord_individul_obj[indivial_i, :] = [ 1.  6.  8. 14.]
83   cord_individul_obj[indivial_i, :] = [ 2.  6. 12. 18.]
84   cord_individul_obj[indivial_i, :] = [ 3.  4. 32. 36.]
85   cord_individul_obj[indivial_i, :] = [ 4.  3. 114. 117.]
86   cord_individul_obj[indivial_i, :] = [ 5.  3. 94. 97.]
87   cord_individul_obj[indivial_i, :] = [ 6.  4. 30. 34.]
88   cord_individul_obj[indivial_i, :] = [ 7.  6. 16. 22.]
89   cord_individul_obj[indivial_i, :] = [ 8.  4. 122. 126.]
90   cord_individul_obj[indivial_i, :] = [ 9.  6.  8. 14.]
91
92   min(cord_individul_obj[:, 3]) = 14.0
93   historl_G_best_iter[iter, 3] = 14.0
94   Begin iteration:
95
96   iter = 4
97     cord_individul_obj[indivial_i, :] = [ 0.  5. 56. 61.]
98     cord_individul_obj[indivial_i, :] = [ 1.  5. 92. 97.]
99     cord_individul_obj[indivial_i, :] = [ 2.  4. 28. 32.]
100    cord_individul_obj[indivial_i, :] = [ 3.  6. 48. 54.]
101    cord_individul_obj[indivial_i, :] = [ 4.  5. 40. 45.]
102    cord_individul_obj[indivial_i, :] = [ 5.  6. 48. 54.]
103    cord_individul_obj[indivial_i, :] = [ 6.  6. 12. 18.]
104    cord_individul_obj[indivial_i, :] = [ 7.  6. 64. 70.]
105    cord_individul_obj[indivial_i, :] = [ 8.  6.  8. 14.]
106    cord_individul_obj[indivial_i, :] = [ 9.  6. 48. 54.]
107
108    min(cord_individul_obj[:, 3]) = 14.0
109    historl_G_best_iter[iter, 3] = 14.0
110    Begin iteration:
111
112    iter = 5
113      cord_individul_obj[indivial_i, :] = [ 0.  6. 112. 118.]
114      cord_individul_obj[indivial_i, :] = [ 1.  6.  8. 14.]
115      cord_individul_obj[indivial_i, :] = [ 2.  4. 28. 32.]
116      cord_individul_obj[indivial_i, :] = [ 3.  6. 48. 54.]
117      cord_individul_obj[indivial_i, :] = [ 4.  6. 40. 46.]
118      cord_individul_obj[indivial_i, :] = [ 5.  5. 68. 73.]
119      cord_individul_obj[indivial_i, :] = [ 6.  6. 12. 18.]
120      cord_individul_obj[indivial_i, :] = [ 7.  5. 40. 45.]
121      cord_individul_obj[indivial_i, :] = [ 8.  6. 32. 38.]
122      cord_individul_obj[indivial_i, :] = [ 9.  6. 48. 54.]
123
124      min(cord_individul_obj[:, 3]) = 14.0
125      historl_G_best_iter[iter, 3] = 14.0
126      Begin iteration:
127
128      iter = 6
129        cord_individul_obj[indivial_i, :] = [ 0.  6.  8. 14.]
130        cord_individul_obj[indivial_i, :] = [ 1.  4. 72. 76.]
131        cord_individul_obj[indivial_i, :] = [ 2.  4. 70. 74.]
132        cord_individul_obj[indivial_i, :] = [ 3.  6. 48. 54.]
133        cord_individul_obj[indivial_i, :] = [ 4.  5. 12. 17.]
134        cord_individul_obj[indivial_i, :] = [ 5.  6. 24. 30.]
135        cord_individul_obj[indivial_i, :] = [ 6.  6. 12. 18.]
136        cord_individul_obj[indivial_i, :] = [ 7.  6. 20. 26.]
137        cord_individul_obj[indivial_i, :] = [ 8.  5. 12. 17.]
138        cord_individul_obj[indivial_i, :] = [ 9.  6. 94. 100.]
139
140        min(cord_individul_obj[:, 3]) = 14.0
141        historl_G_best_iter[iter, 3] = 14.0
142        Begin iteration:
143
144        iter = 7
145          cord_individul_obj[indivial_i, :] = [ 0.  5. 24. 29.]
146          cord_individul_obj[indivial_i, :] = [ 1.  4. 48. 52.]
147          cord_individul_obj[indivial_i, :] = [ 2.  4. 28. 32.]
148          cord_individul_obj[indivial_i, :] = [ 3.  6. 48. 54.]
149          cord_individul_obj[indivial_i, :] = [ 4.  3. 40. 43.]
150          cord_individul_obj[indivial_i, :] = [ 5.  5. 80. 85.]
151          cord_individul_obj[indivial_i, :] = [ 6.  6. 12. 18.]
152          cord_individul_obj[indivial_i, :] = [ 7.  6. 40. 46.]
153          cord_individul_obj[indivial_i, :] = [ 8.  5. 32. 37.]
154          cord_individul_obj[indivial_i, :] = [ 9.  6.  8. 14.]
155
156          min(cord_individul_obj[:, 3]) = 14.0
157          historl_G_best_iter[iter, 3] = 14.0
158          Begin iteration:
159
160          iter = 8
161            cord_individul_obj[indivial_i, :] = [ 0.  6. 70. 76.]
162            cord_individul_obj[indivial_i, :] = [ 1.  6. 24. 30.]
163            cord_individul_obj[indivial_i, :] = [ 2.  5. 64. 69.]

```

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164 cord_individul_obj[indivial_i,:] = [ 3. 6. 48. 54.]
165 cord_individul_obj[indivial_i,:] = [ 4. 6. 12. 18.]
166 cord_individul_obj[indivial_i,:] = [ 5. 6. 8. 14.]
167 cord_individul_obj[indivial_i,:] = [ 6. 6. 12. 18.]
168 cord_individul_obj[indivial_i,:] = [ 7. 5. 12. 17.]
169 cord_individul_obj[indivial_i,:] = [ 8. 6. 20. 26.]
170 cord_individul_obj[indivial_i,:] = [ 9. 6. 106. 112.]
171
172 min(cord_individul_obj[:,3]) = 14.0
173 historl_G_best_iter[iter,3] = 14.0
174 Begin iteration:
175
176 iter = 9
177 cord_individul_obj[indivial_i,:] = [ 0. 3. 116. 119.]
178 cord_individul_obj[indivial_i,:] = [ 1. 5. 8. 13.]
179 cord_individul_obj[indivial_i,:] = [ 2. 5. 38. 43.]
180 cord_individul_obj[indivial_i,:] = [ 3. 6. 8. 14.]
181 cord_individul_obj[indivial_i,:] = [ 4. 5. 54. 59.]
182 cord_individul_obj[indivial_i,:] = [ 5. 6. 106. 112.]
183 cord_individul_obj[indivial_i,:] = [ 6. 6. 8. 14.]
184 cord_individul_obj[indivial_i,:] = [ 7. 6. 32. 38.]
185 cord_individul_obj[indivial_i,:] = [ 8. 5. 38. 43.]
186 cord_individul_obj[indivial_i,:] = [ 9. 6. 8. 14.]
187
188 min(cord_individul_obj[:,3]) = 13.0
189 historl_G_best_iter[iter,3] = 13.0
190 Begin iteration:
191
192 iter = 10
193 cord_individul_obj[indivial_i,:] = [ 0. 5. 8. 13.]
194 cord_individul_obj[indivial_i,:] = [ 1. 6. 74. 80.]
195 cord_individul_obj[indivial_i,:] = [ 2. 6. 12. 18.]
196 cord_individul_obj[indivial_i,:] = [ 3. 4. 24. 28.]
197 cord_individul_obj[indivial_i,:] = [ 4. 6. 12. 18.]
198 cord_individul_obj[indivial_i,:] = [ 5. 6. 24. 30.]
199 cord_individul_obj[indivial_i,:] = [ 6. 5. 12. 17.]
200 cord_individul_obj[indivial_i,:] = [ 7. 6. 12. 18.]
201 cord_individul_obj[indivial_i,:] = [ 8. 6. 12. 18.]
202 cord_individul_obj[indivial_i,:] = [ 9. 6. 82. 88.]
203
204 min(cord_individul_obj[:,3]) = 13.0
205 historl_G_best_iter[iter,3] = 13.0
206 Iteration calculate over
207
208
209
210
211 All item are in Bin and:
212 Bin area = 1080
213 Real_area = 105.0
214 Proportion_of_area = 0.09722222222222222
215 BEST_CHROM =
216 berth: [10.5 26. 20. 2.5 6.5 15. ]
217 time: [0. 0. 0. 0. 0. 0.]
218 num_QC: [4. 2. 3. 3. 3. 2.]
219 Objective function values and some other indicators:
220 Obj0 = 5.00 Obj1 = 8.00 Obj0 + Obj1 = 13.00
221 Total movement of crane: 8.00
222 Total waiting time in berth position: 0.00
223 Total index of q during berthing: 610.00
224 Specific arrangement for each vessel:
225 V_id: 0 li: 5.0 xi: 10.5 bow of i: 8.0 tail of i: 13.0 gama_i0: 0.0 gama_i1: 0
.0 gama_i1 + 1: 1.0 gama_i1 - gama_i0: 0.0 duration_time_i: 1.0 demand_i: 80.0 work
load_i: 80.0 work load gap_i: 0
226 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
227 V_id: 2 li: 6.0 xi: 20.0 bow of i: 17.0 tail of i: 23.0 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
228 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
80.0 gama_i1 + 1: 2.0 gama_i1 - gama_i0: 1.0 duration_time_i: 2.0 demand_i: 80.0 work load_i:
work load gap_i: 0
229 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: 3.0
200.0 gama_i1 + 1: 4.0 gama_i1 - gama_i0: 3.0 duration_time_i: 4.0 demand_i: 200.0 work load_i:
work load gap_i: 0
230 V_id: 5 li: 4.0 xi: 15.0 bow of i: 13.0 tail of i: 17.0 gama_i0: 0.0 gama_i1: 5
.0 gama_i1 + 1: 6.0 gama_i1 - gama_i0: 5.0 duration_time_i: 6.0 demand_i: 220.0 work
load_i: 220.0 work load gap_i: 0
231
232 Algorithm finished and the total CPU time: 38 s
233 End
234

```