Task 6: Circuit Design Heuristic

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In Part6, the optimum circuit changes as the various problem-specification parameters change will be investigated and the circuit design opinions will be shown.

1. Summary

First, the two graphs reflect how purity and the price cost of waste impact the final performance. It is clear to see that the higher the purity, the better our performance. At the same time, the more cost of waste, the less the profit. On this basis, how circuit should be designed under different problems can be analyzed.

2. Number of units

When the number of units increases, in general, the circuit diagram will select several units as intermediate units. As it can see, in the following diagram, the units circled in yellow can be called intermediate units.

The characteristic of the intermediate unit is that the units circled by the blue are used for gradual separation, and these units will uniformly transport the **concentrate stream** to the intermediate unit to increase the purity of the intermediate unit. We call such a blue unit—secondary unit.

This is easy to understand because if too many units' tail stream and **concentrate stream** send to the same units, it will make the separation meaningless. The result could be found that as the number of units increases, the number of intermediate units will also increase, and the law is roughly that the later the intermediate units appear, the fewer secondary units converge on this unit.

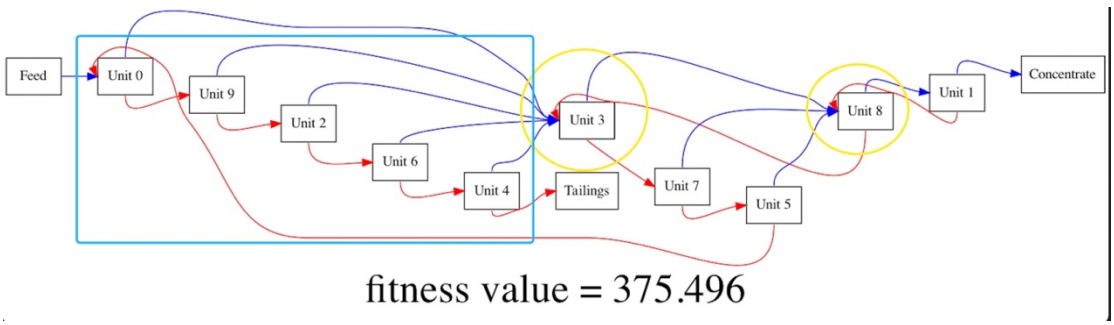

Figure2.1 num_units=10

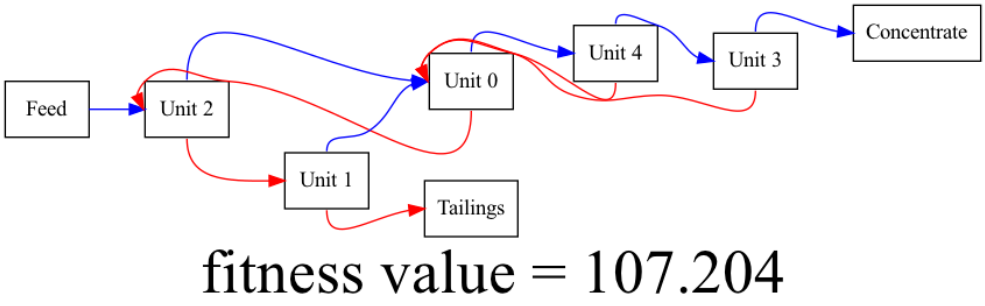

Figure2.2 num_units = 5

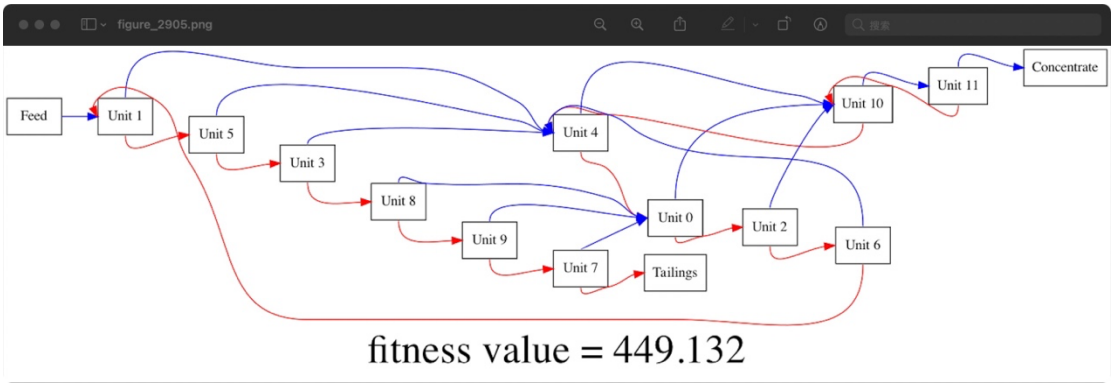

Figure 2.3 num_units = 12

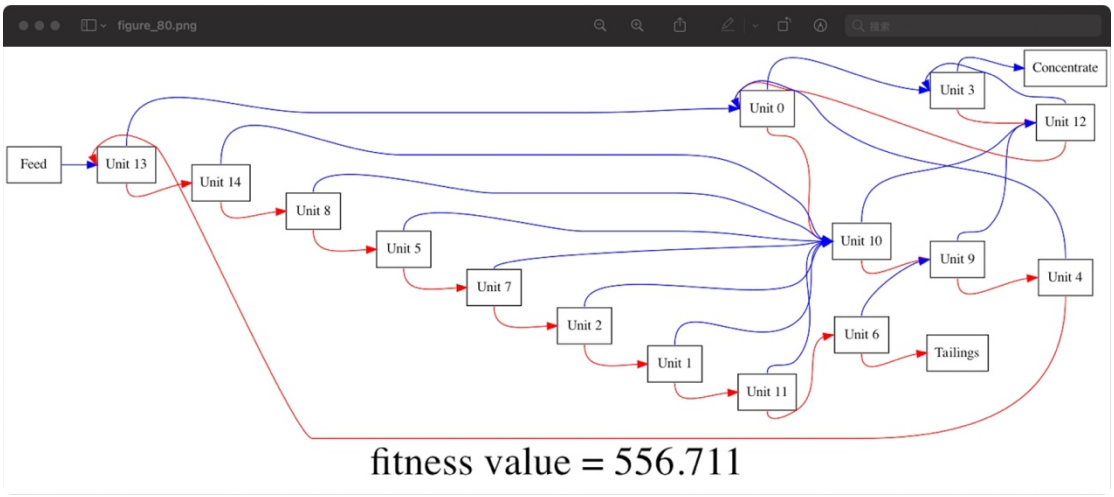

Figure 2.4 num_units = 15

3. Purity

When the initial purity is low, the circuit diagram selects more intermediate units to gradually increase pruity. However, when the initial purity is already high, the increase in intermediate units may not have an excessive impact on the purity of the intermediate unit, so the number of intermediate units will be reduced.

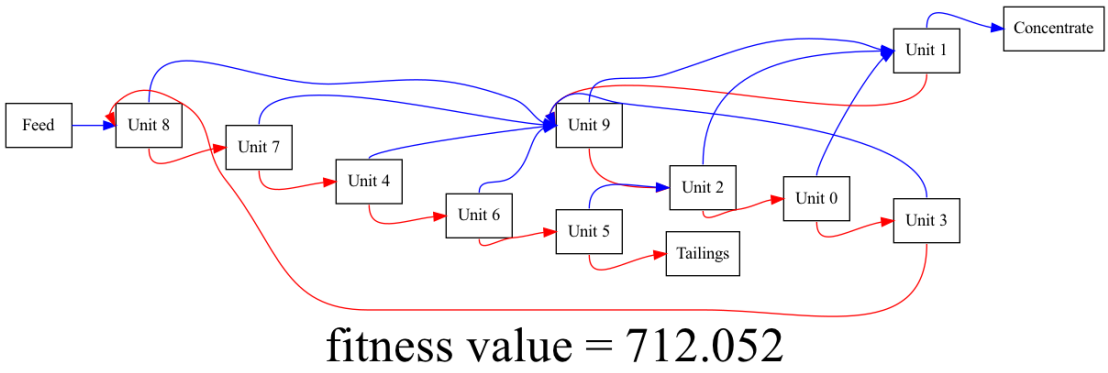

Figure 3.1 Cgor=20, Cwaste=100

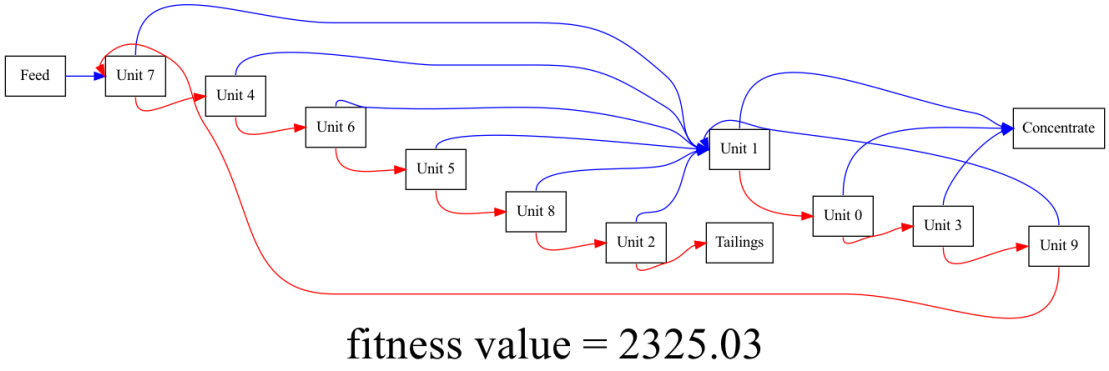

Figure 3.2 Cgor = 80, Cwaste = 100

4. Price paid and cost of waste

When the cost increases compared to the amount paid, the number of intermediate units is added. When the number of intermediate units is small, there will be a large number of secondary units for gradually increasing purity, but when the cost is too high, experiencing too many units may increase the cost, thus offsetting the benefits of purity increase.

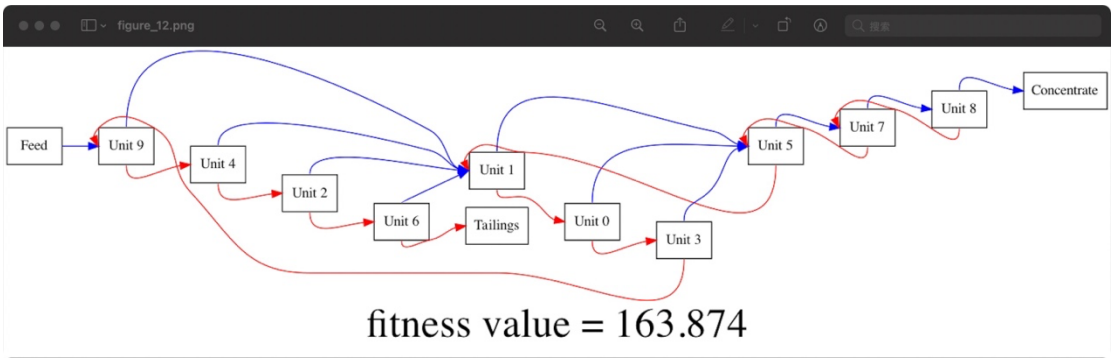

Figure 4.1 paid = 50, cost = 700

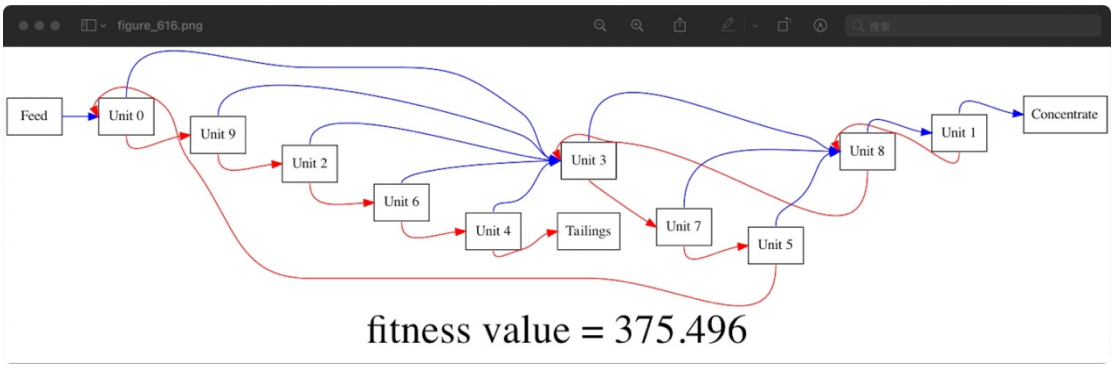

Figure 4.2 paid = 10, cost = 100

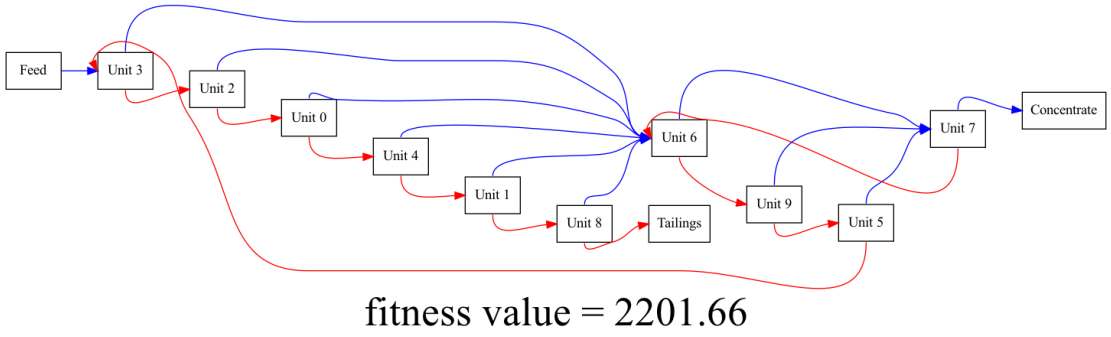

Figure 4.3 paid = 500, cost = 500

5. Design and Conclusion

Therefore, when designing a circuit, if the number of units increases, the number of intermediate units is regularly increased. If the purity is lower, the number of intermediate units also needs to be increased. However, when the cost of waste material is too high, the number of intermediate units should be reduced in an appropriate amount, so as not to cause too expensive costs to reduce the benefits.