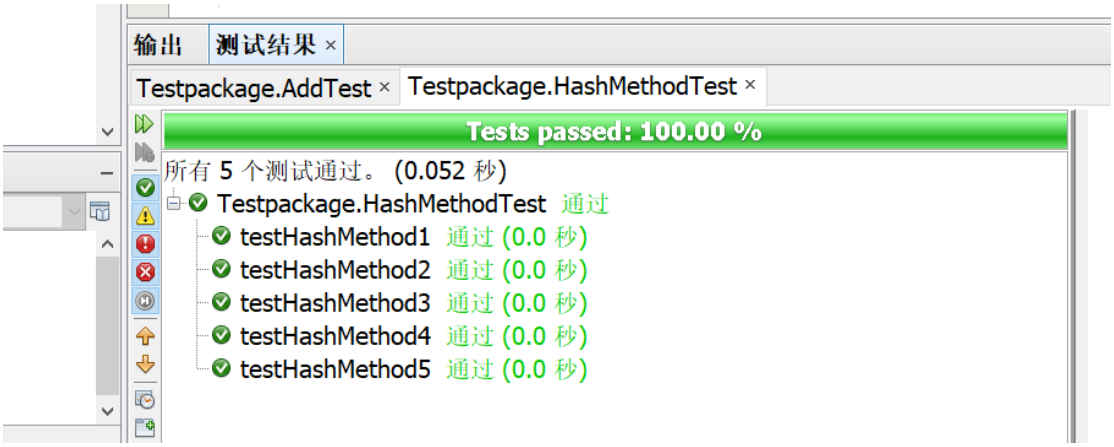
Assignment 4 Birthdays and picture cards Analysis Report

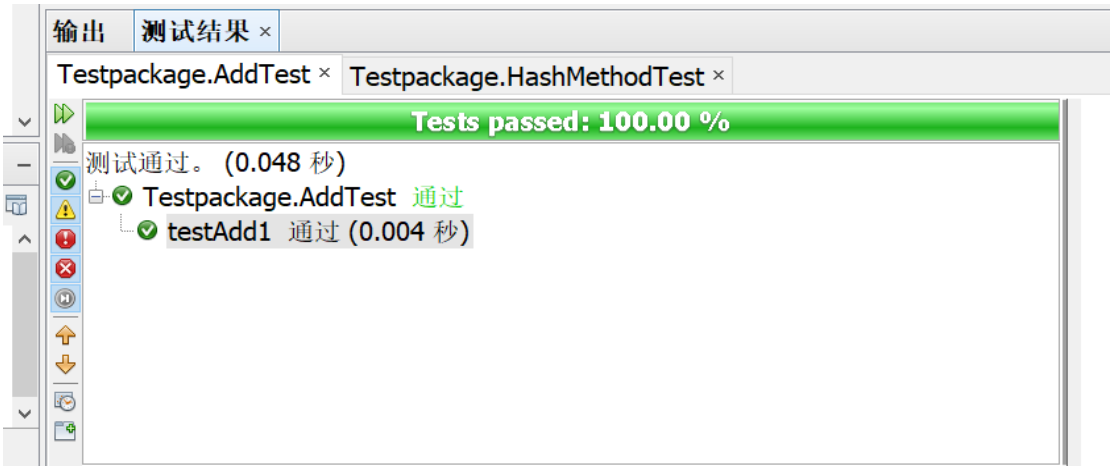
JinZhang

I. Unit Test

The two screenshots below show that the program passed the unit tests. The first unit test examines whether the hash function works well, while the second unit test examines whether the “add” function is right (i.e. When adding a key, the hash function operates correctly and the logic of counting balls in a bin is correct).

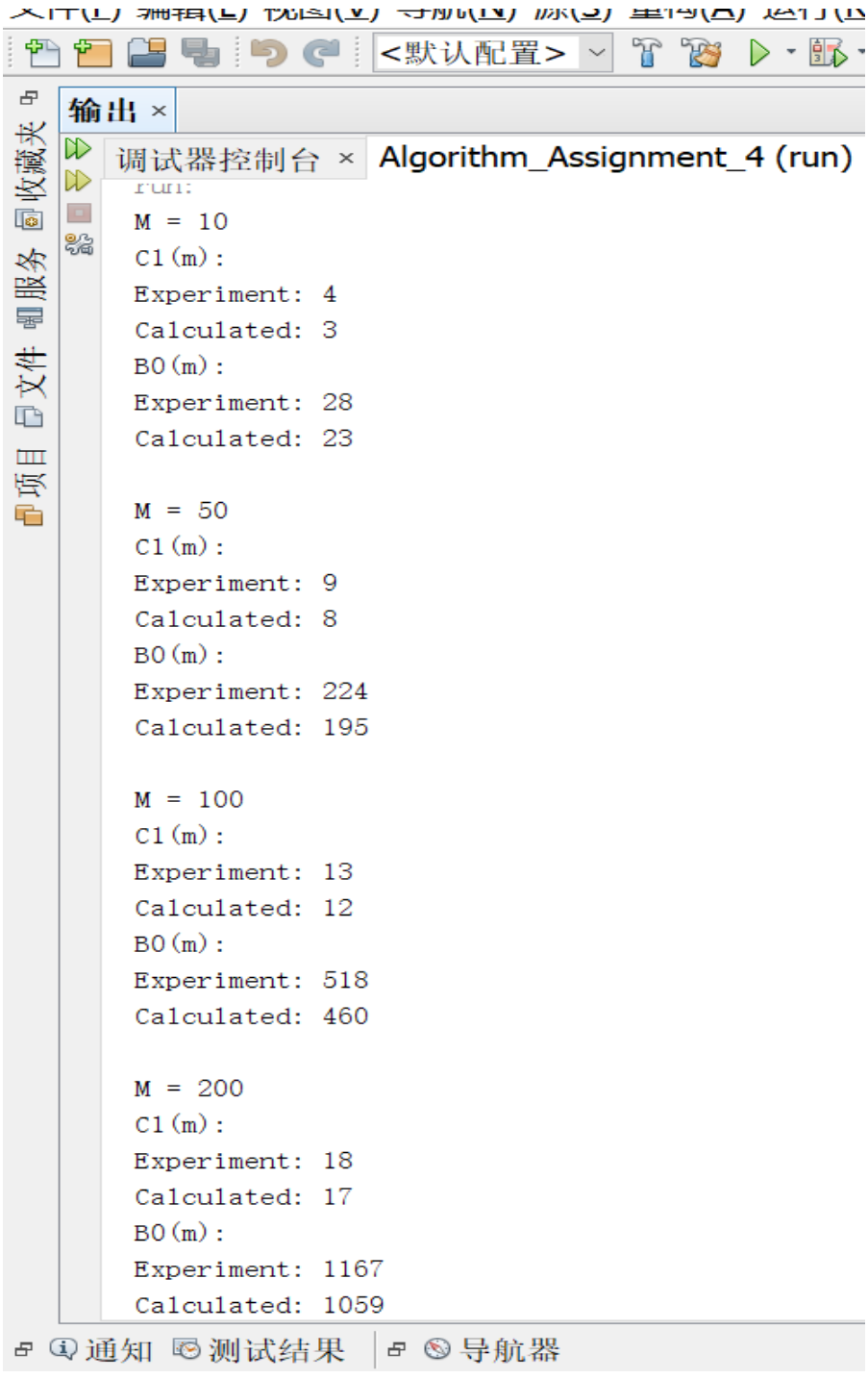


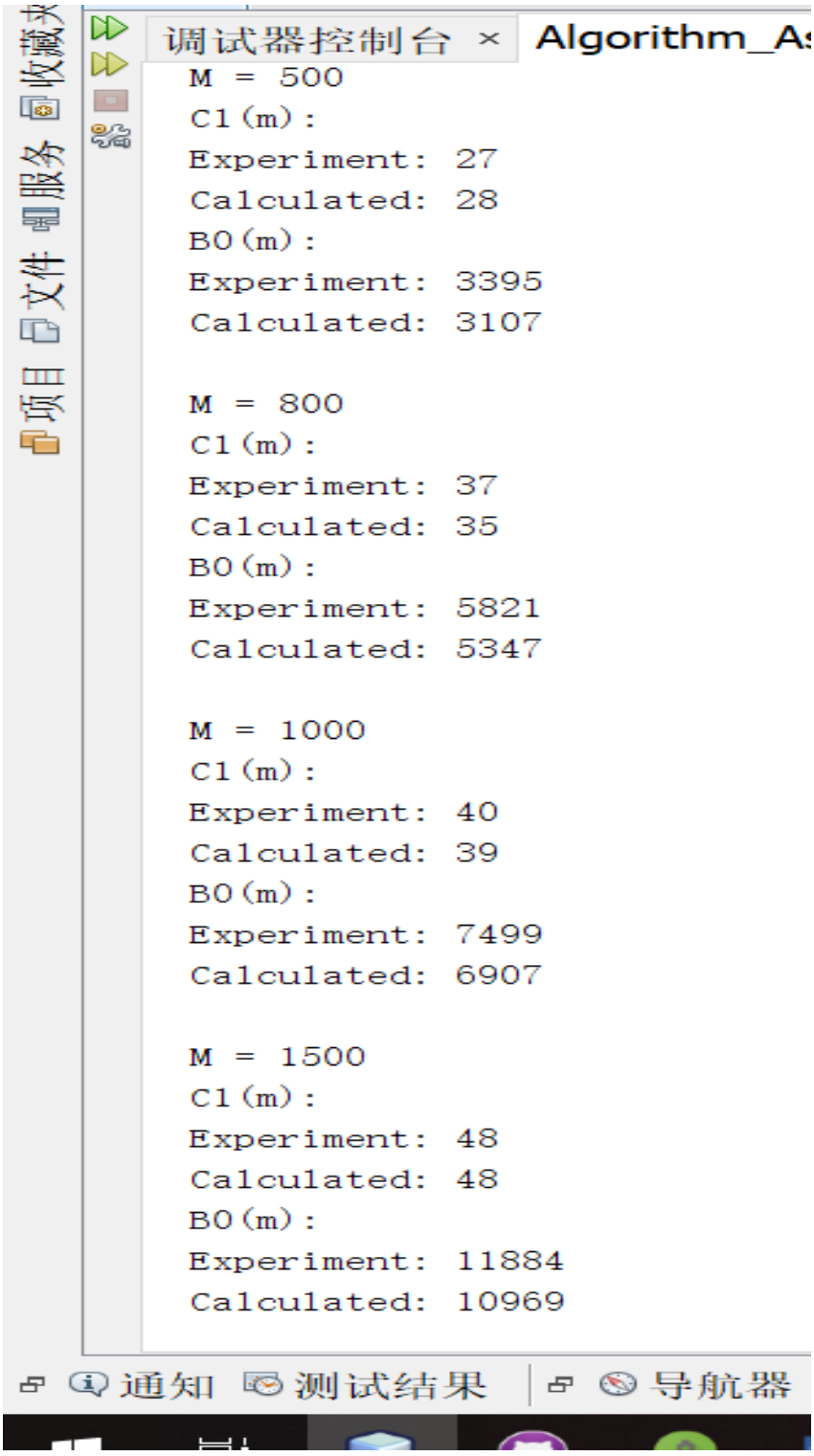
First Unit Test



Second Unit Test

II. Experiment Result




调试器控制台
Algorithm_As
M = 500
C1(m):
Experiment: 27
Calculated: 28
B0(m):
Experiment: 3395
Calculated: 3107
M = 800
C1(m):
Experiment: 37
Calculated: 35
B0(m):
Experiment: 5821
Calculated: 5347
M = 1000
C1(m):
Experiment: 40
Calculated: 39
B0(m):
Experiment: 7499
Calculated: 6907
M = 1500
C1(m):
Experiment: 48
Calculated: 48
B0(m):
Experiment: 11884
Calculated: 10969
通知
测试结果
导航器

III. Analysis

Based on the screenshots above, we can find that the (average) experiment results approximate to the ones which are calculated using the expressions below.

$$C_1(m) \sim \sqrt{\pi\, m\, /\, 2}$$

$$B_0(m) \sim m \ln m$$

So, we can infer that:

1) After about $\sqrt{\pi m/2}$ hashes/throws, the first collision will occur.
2) After about $m \ln m$ hashes/throws, all bins/slots will be filled.