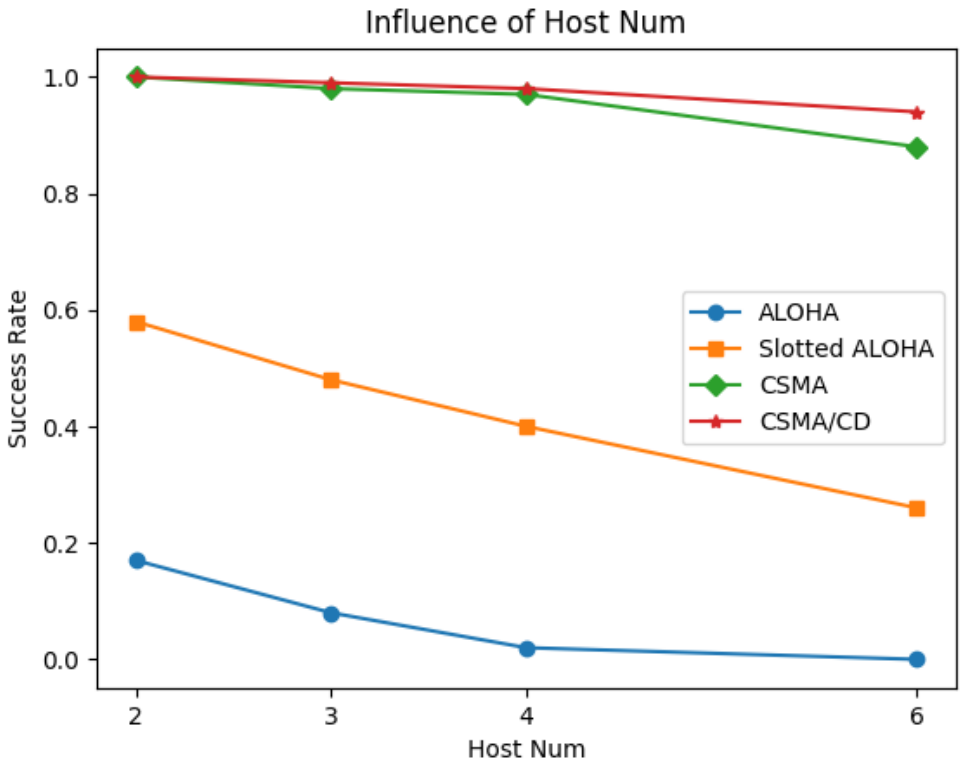
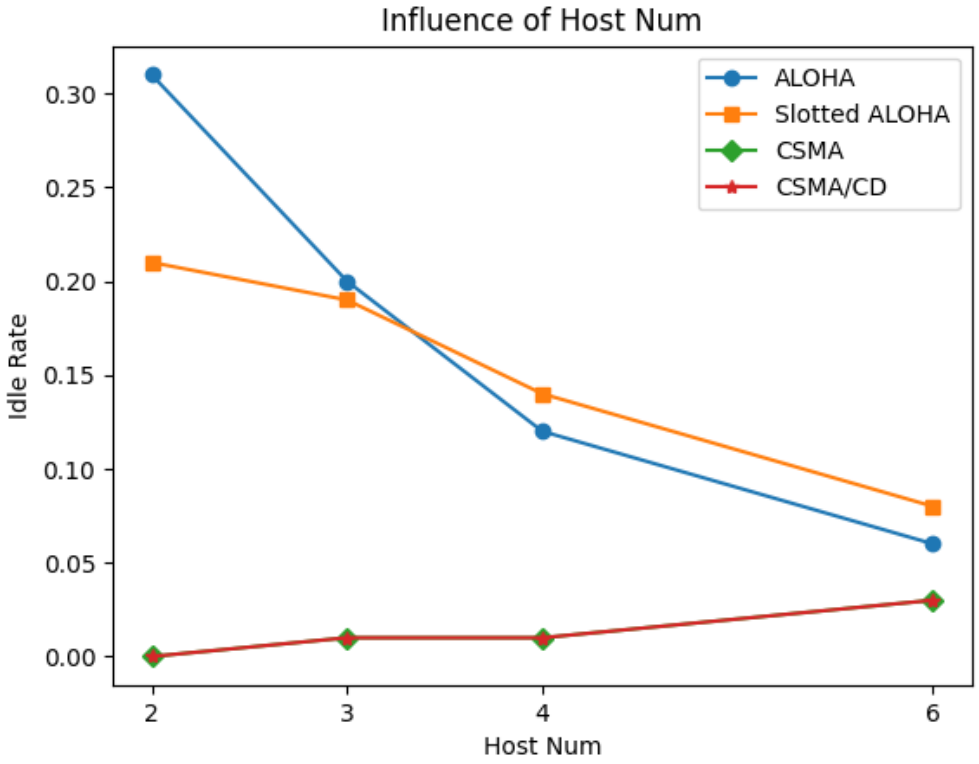
Part 1 coding:

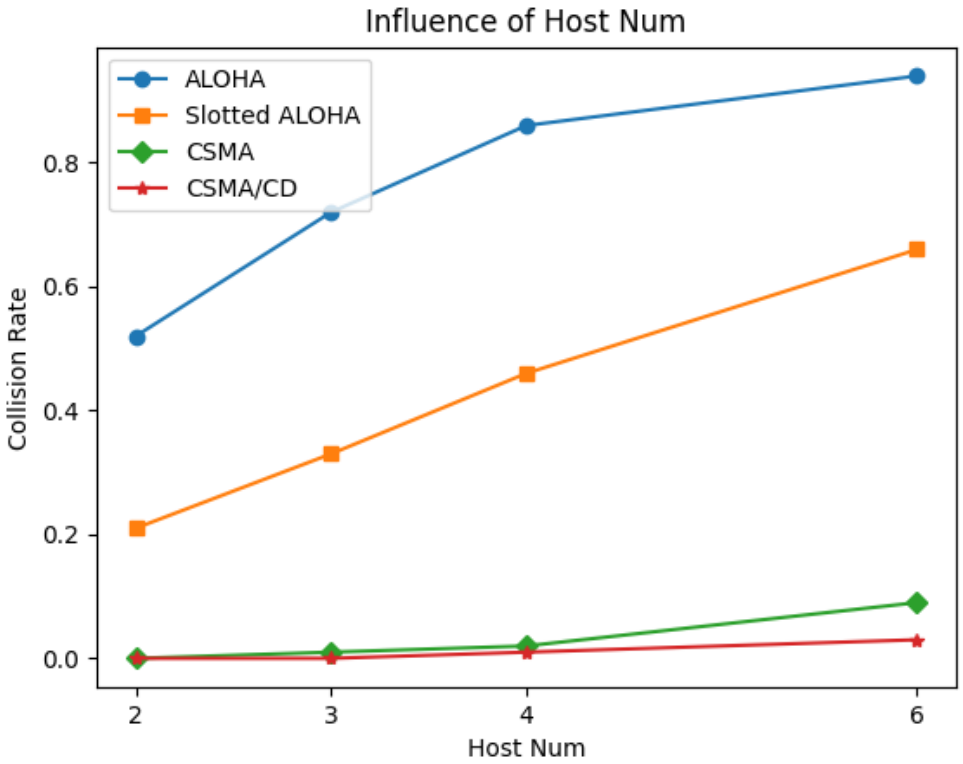
```
aloha
h0: ..................................................<--><---|.................<---|..<---|.........
    V                                                    V       V       V
h1: ....<---|........<---|........<--->.....................<---|......<--><---|.....................
    V                                V                                   V       V
h2: .<---|...........<---|.................<--><-->.............................<---|..<---|.....<--
success_rate: 0.25
idle_rate: 0.36
collision_rate: 0.39

slotted_aloha
                                                     V   V                 V       V
h0: ..................................................<--><---|.....<--->.....<---|.............
    V                                                    V       V       V
h1: .....<---|...................<--->.....................<---|.....................................
    V                                V                                   V       V
h2: .....<---|.....<--->.............<--->.....................................<---|<--->.....<-->
success_rate: 0.35
idle_rate: 0.5
collision_rate: 0.15

csma
                                                     V   V                 V       V
h0: ..................................................<--><-->.............<-->...<---|...........
    V                                                    V       V       V
h1: ........<-->.....................................................<--><-->.........<---|...........
    V                                V                                   V       V
h2: .<-->.............................<-->.....................................<---|........<---
success_rate: 0.4
idle_rate: 0.5
collision_rate: 0.1

csma_cd
                                                     V   V                 V       V
h0: ..................................................<--><-->.............<-->...<|..............
    V                                                    V       V       V
h1: ........<-->.....................................................<--><-->.........<-|........<--|..
    V                                V                                   V       V
h2: .<-->.............................<-->.....................................<-|.........<|...
success_rate: 0.4
idle_rate: 0.53
collision_rate: 0.07
```

Part 2 questions:

1. Host Num

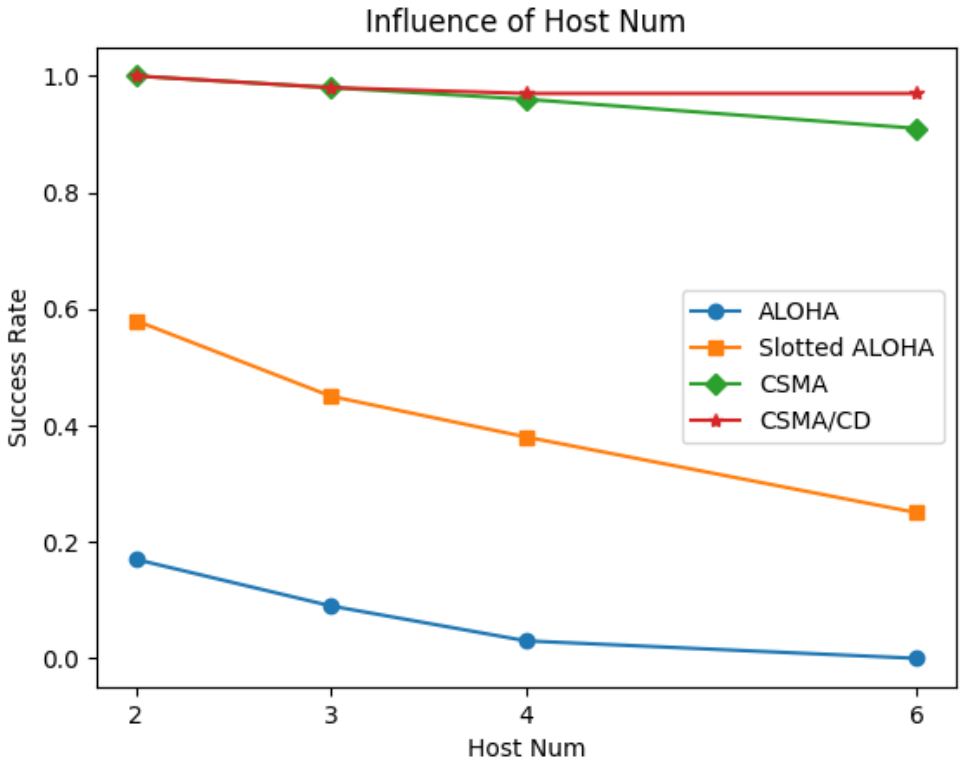


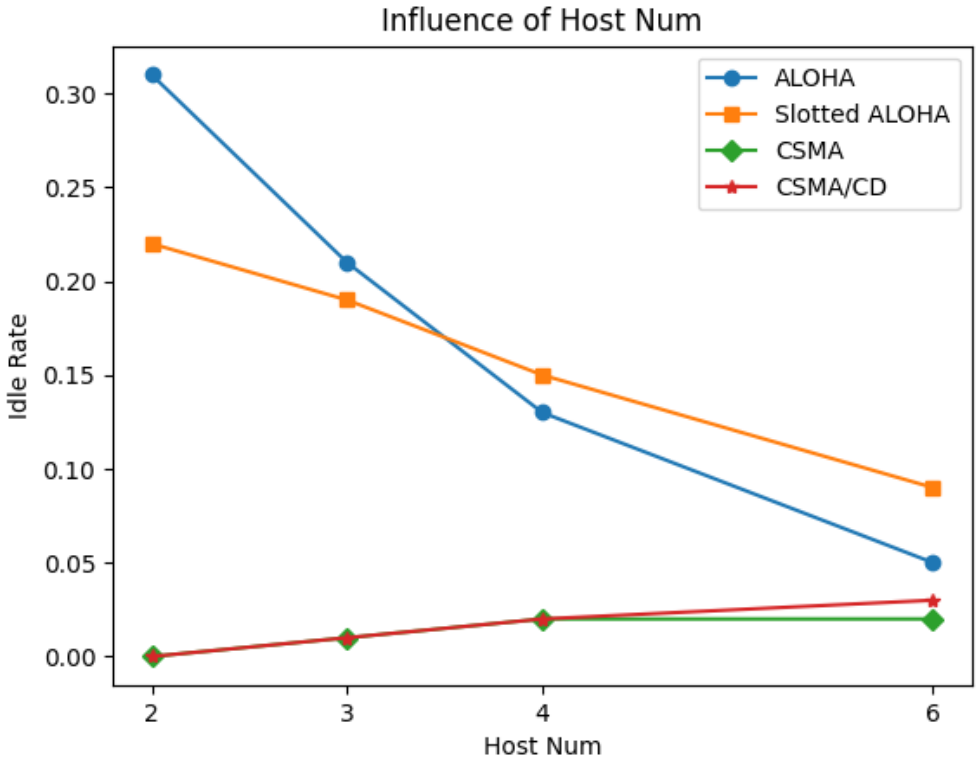

Influence of Host Num
ALOHA
Slotted ALOHA
CSMA
CSMA/CD
Idle Rate
0.30
0.25
0.20
0.15
0.10
0.05
0.00
2
3
4
6
Host Num

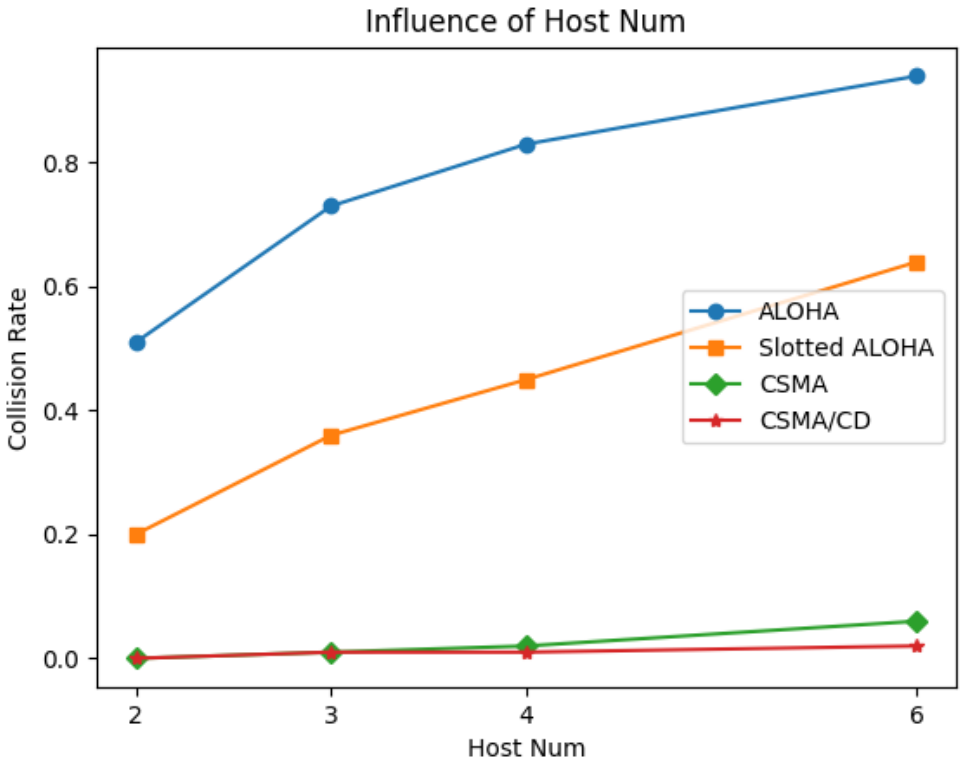

Influence of Host Num
ALOHA
Slotted ALOHA
CSMA
CSMA/CD
Collision Rate
0.8
0.6
0.4
0.2
0.0
2
3
4
6
Host Num

2. max_colision_wait_time and p_resend are defined as:
   max_colision_wait_time = coefficient * packet_time * host_num
   p_resend = 1 / (coefficient * host_num)

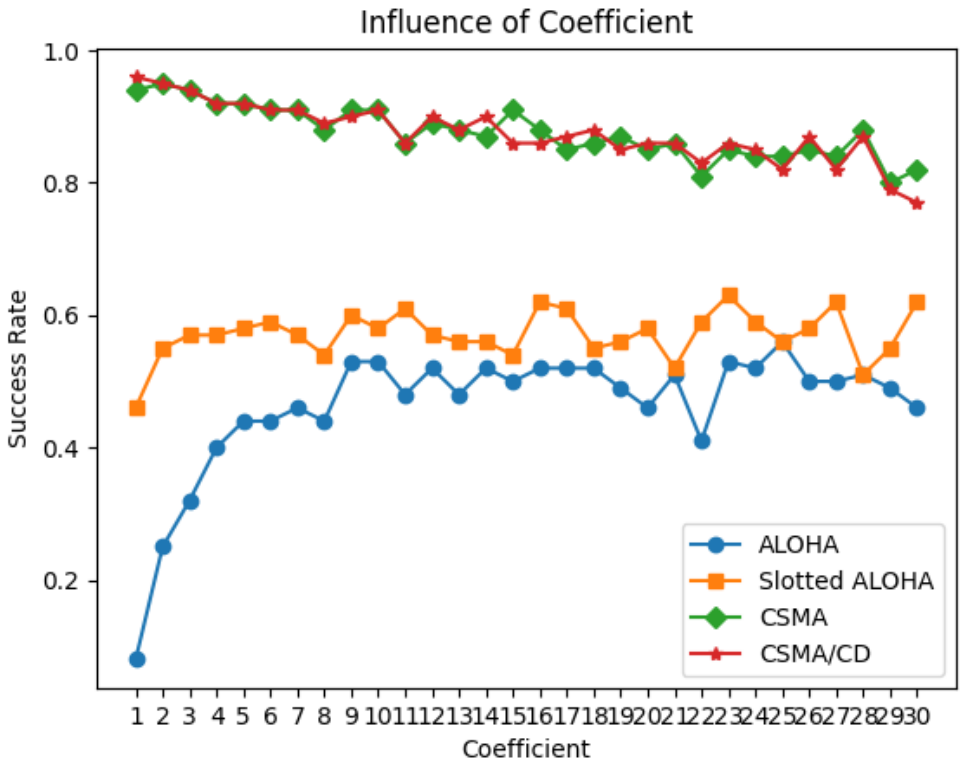
3. 若改成用 coefficient 調整 max_collision_wait_time 和 p_resend 的話，max_collision_wait_time 會因為 host 數量變多而變長，會因為 packet_time 變長而變長；p_resend 會因為 host 數量變多而減小。如此才能降低 collision_rate。

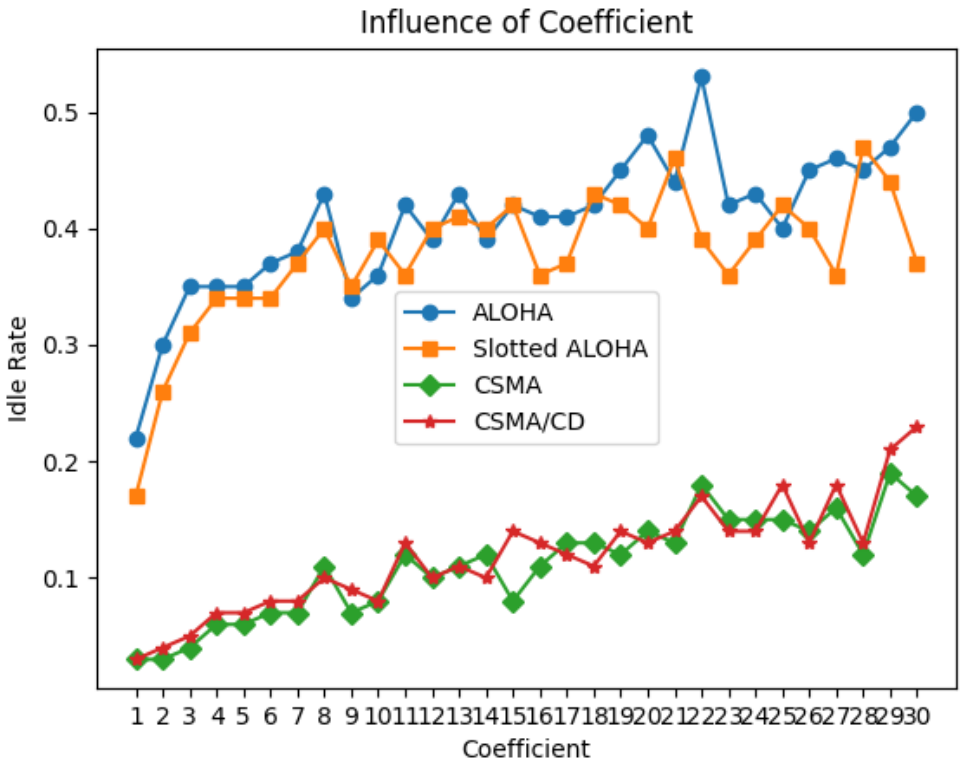


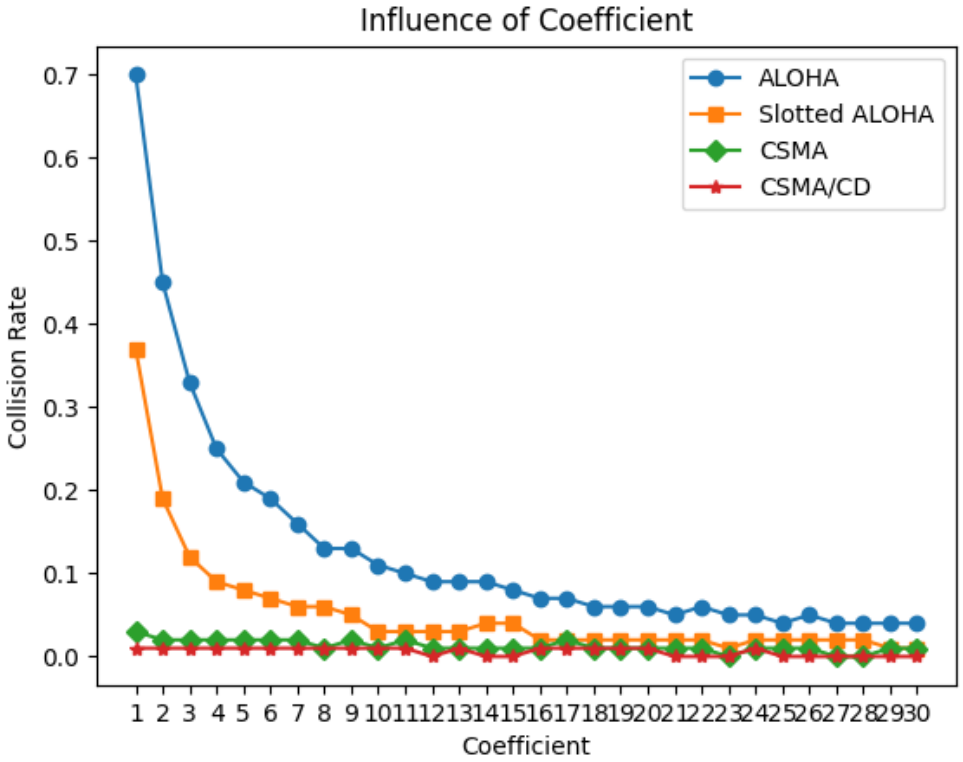

Influence of Host Num
ALOHA
Slotted ALOHA
CSMA
CSMA/CD
Idle Rate
0.30
0.25
0.20
0.15
0.10
0.05
0.00
2
3
4
6
Host Num


Influence of Host Num
ALOHA
Slotted ALOHA
CSMA
CSMA/CD
Collision Rate
0.8
0.6
0.4
0.2
0.0
2
3
4
6
Host Num

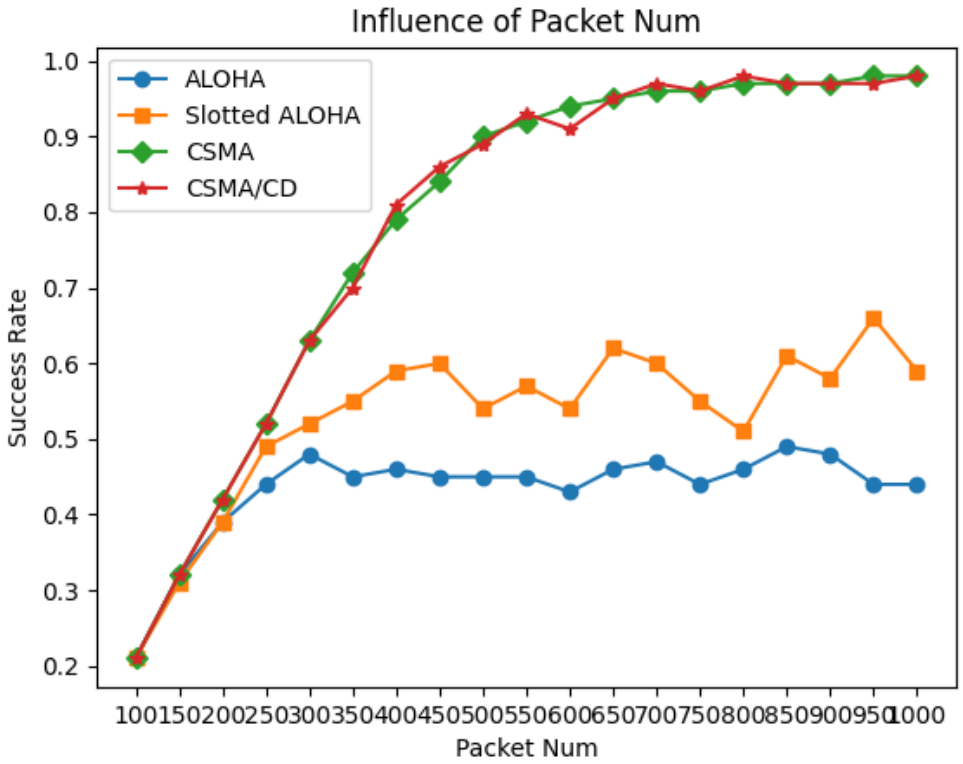
4. Coefficient 變大後，max_collision_wait_time 會變大，封包重送的可能時間點更分散，更能降低 collision rate，但大到一定程度之後，可能已經不太會 collide 了，反而多了很多 idle 的時間。

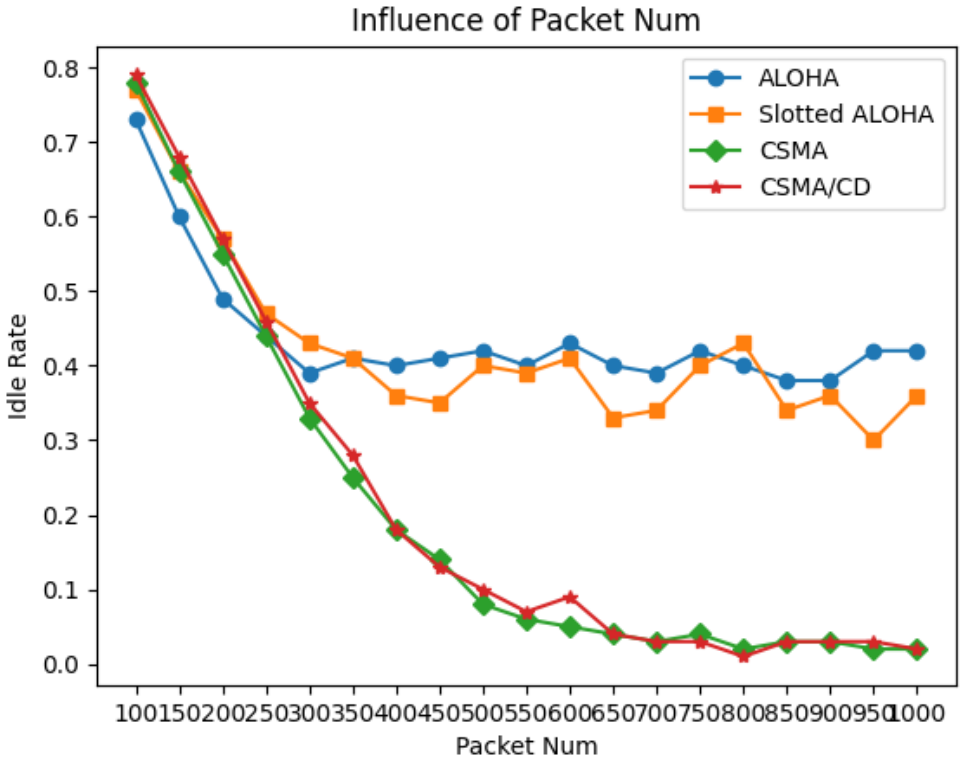


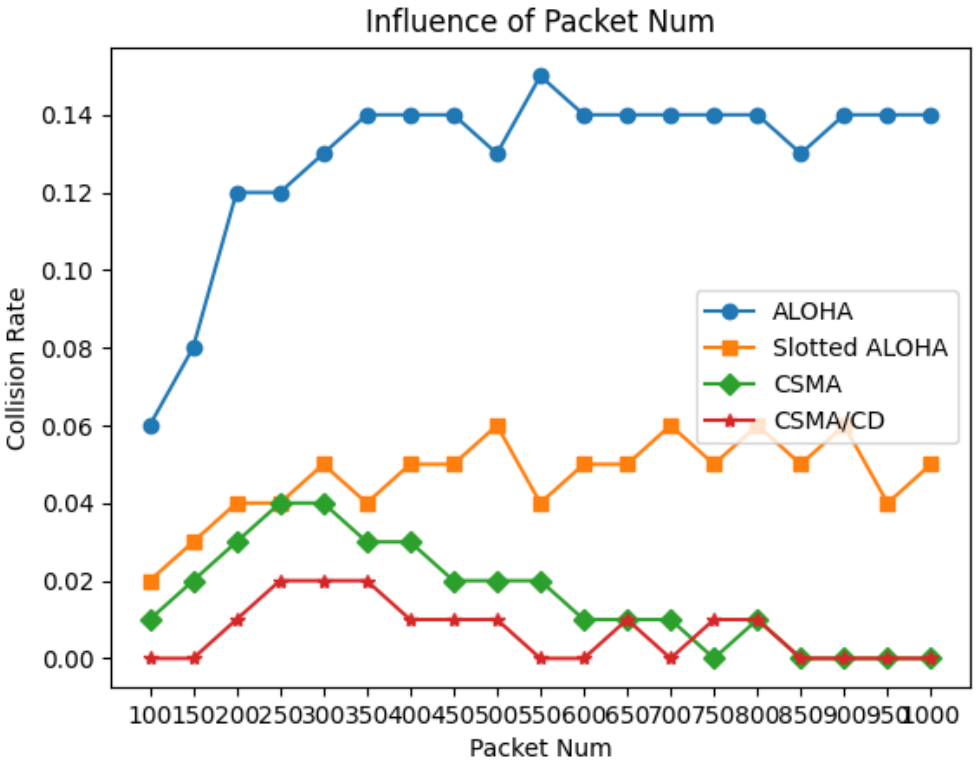



Influence of Coefficient
ALOHA
Slotted ALOHA
CSMA
CSMA/CD
Collision Rate
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Coefficient

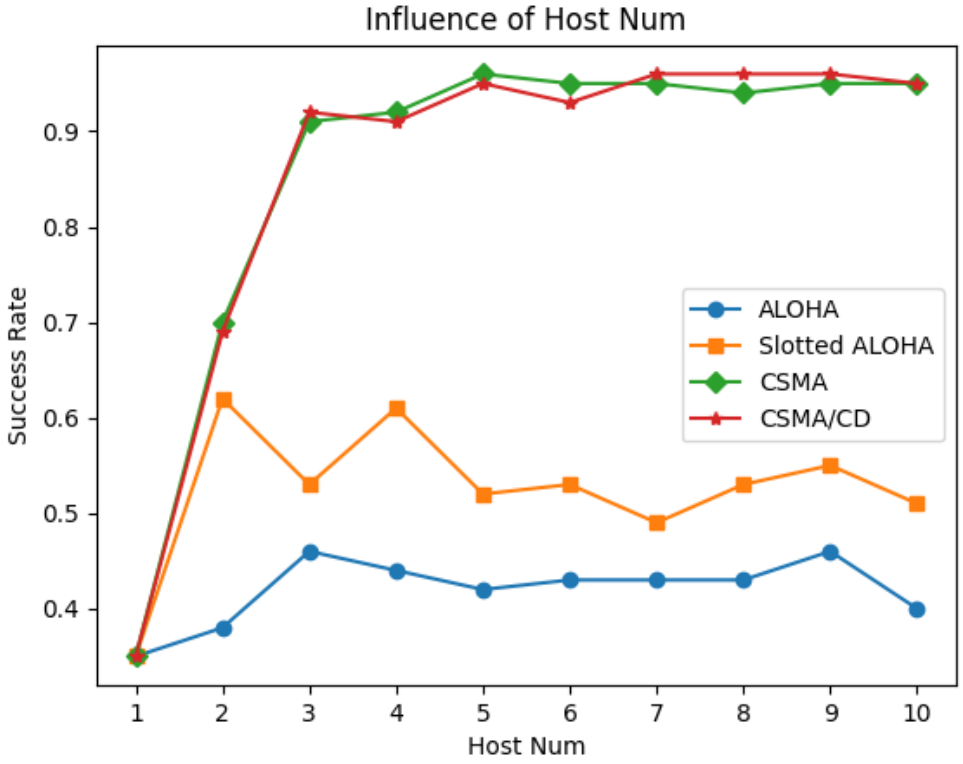
5. Packet num 變多，會讓送封包的時間變長，使得 success rate 拉長，而後面 success rate 會收斂，csma 及 csma/cd 是因為封包數量已經飽和，再多也沒辦法消化；而 aloha 及 slotted_aloha 是因為封包變多，碰撞可能性變大而收斂。

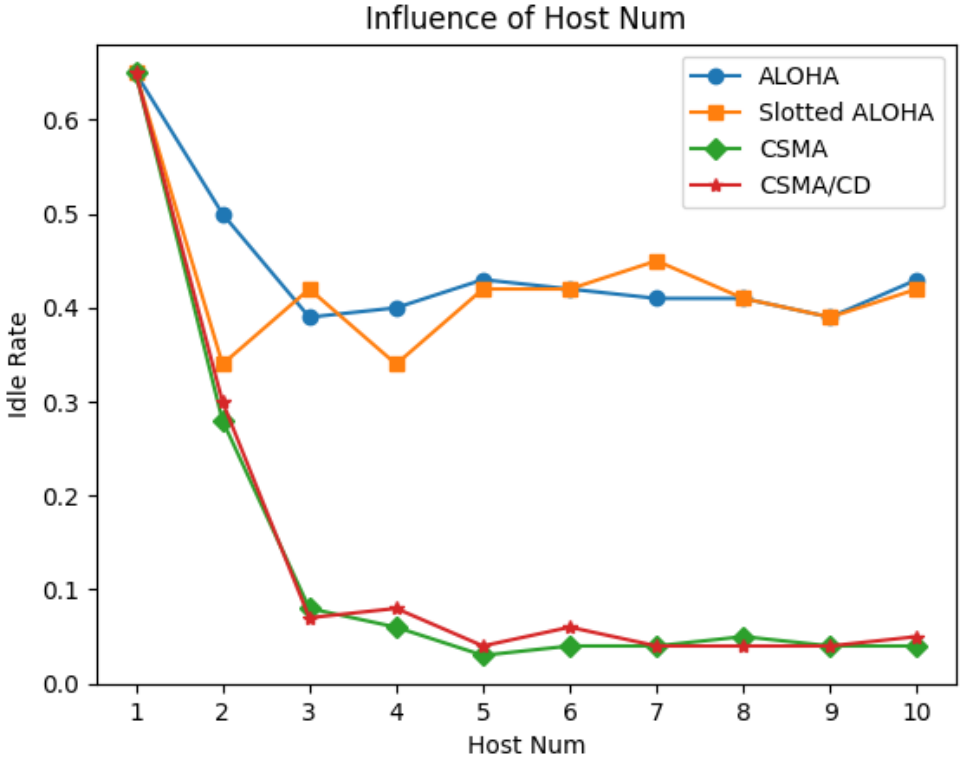


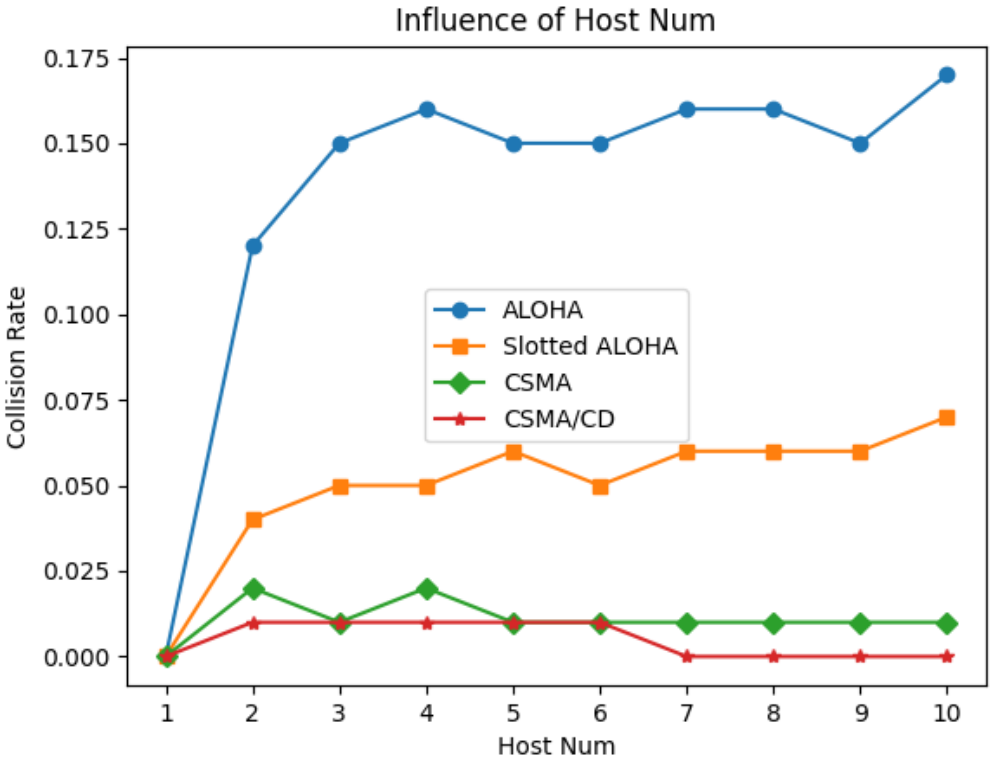

Influence of Packet Num
Idle Rate
Packet Num
ALOHA
Slotted ALOHA
CSMA
CSMA/CD


Influence of Packet Num
Collision Rate
Packet Num
ALOHA
Slotted ALOHA
CSMA
CSMA/CD

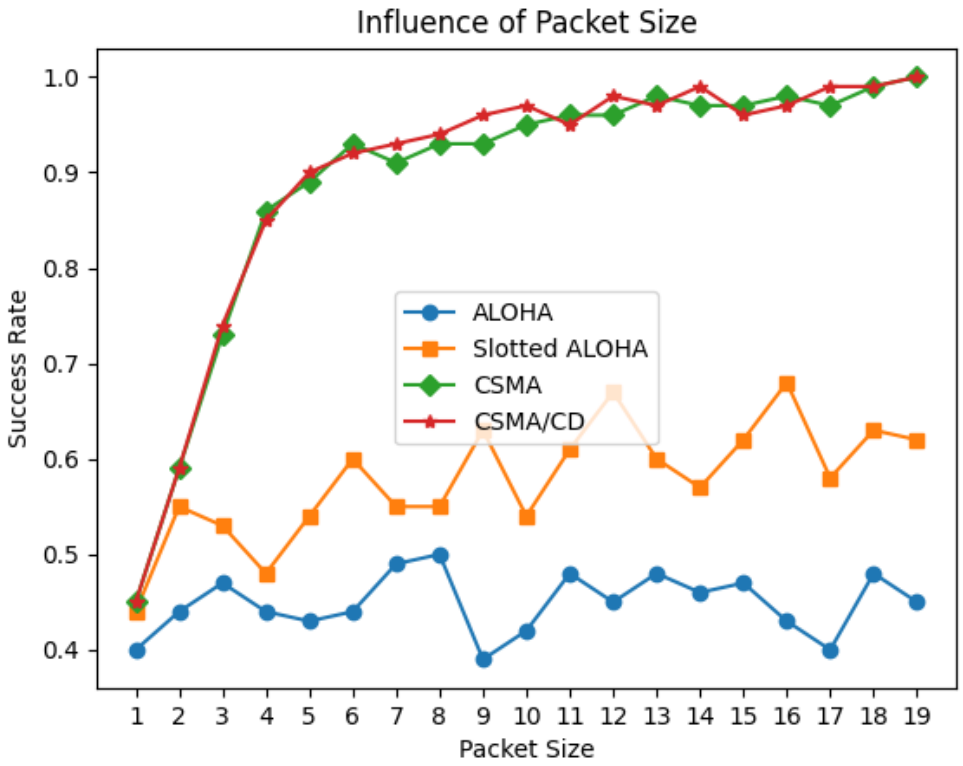
6. Host num 變多和 Packet num 變多同理，都是使得封包變多，因此上升及收斂的原因和 5.一樣。

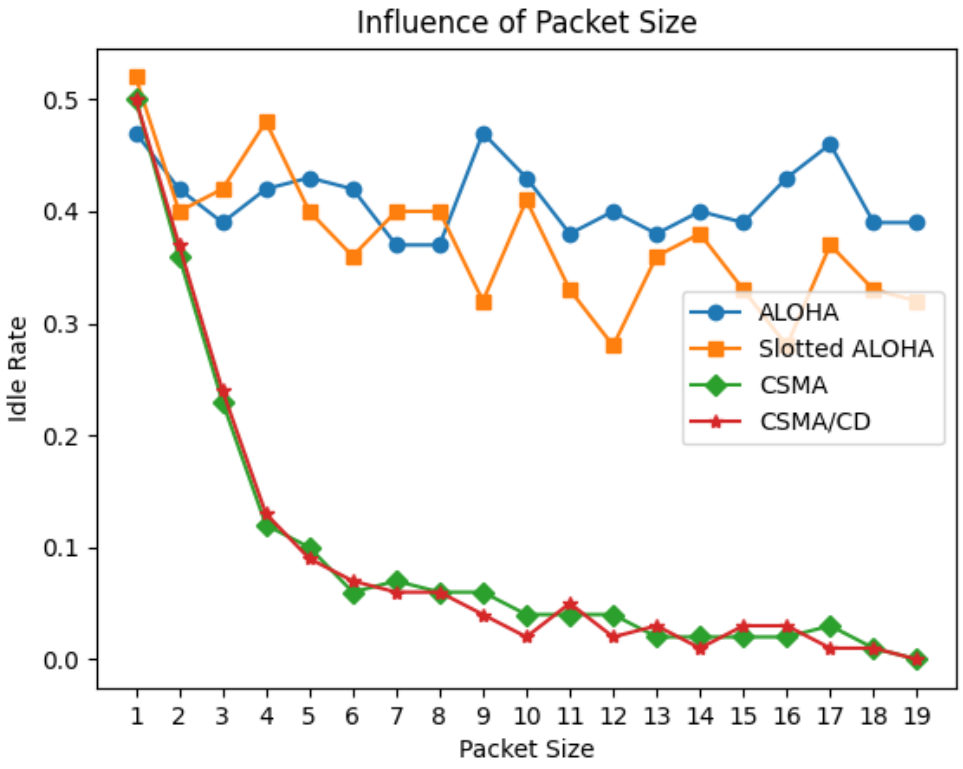


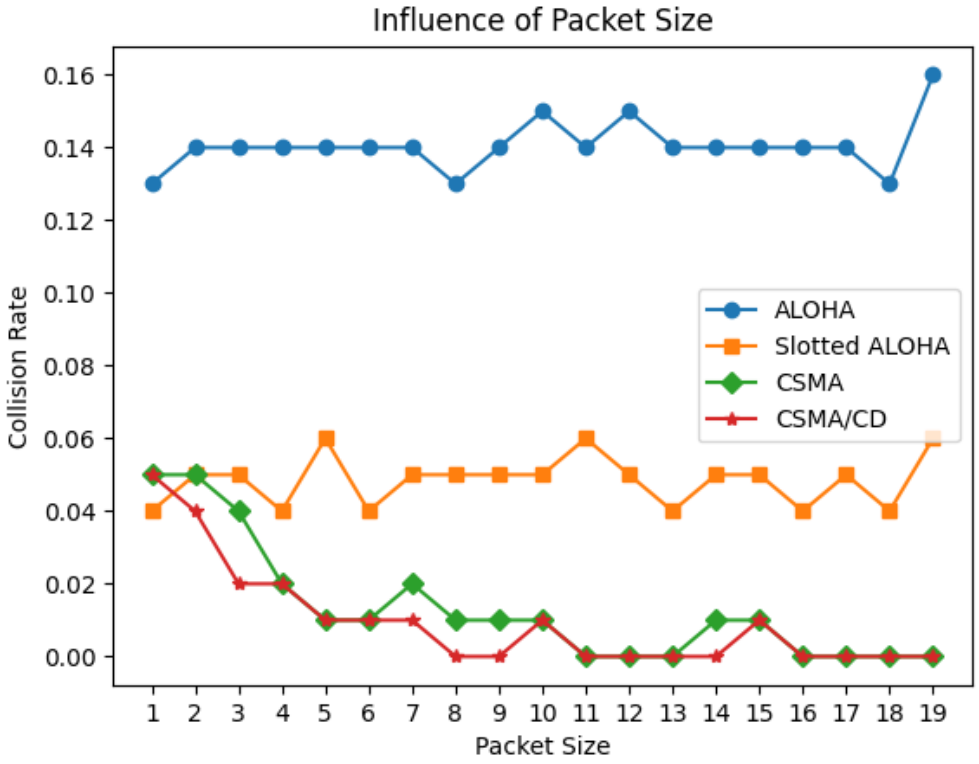



Influence of Host Num
Collision Rate
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
1
2
3
4
5
6
7
8
9
10
Host Num
ALOHA
Slotted ALOHA
CSMA
CSMA/CD

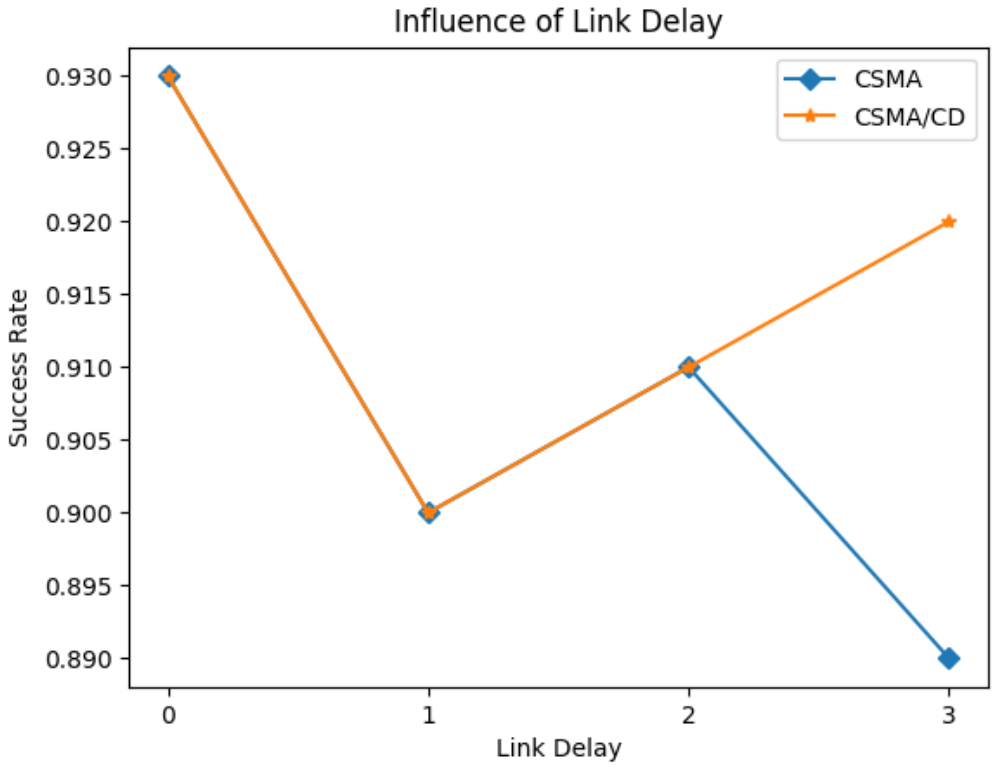
7. 隨著 Packet Size 變長，封包傳送的時間會變多，所以 success_rate 會變高。但對於 aloha 或 slotted_aloha 而言，packet size 變長，碰撞的機會會更大，所以 packet size 變大沒辦法讓 success rate 變大。

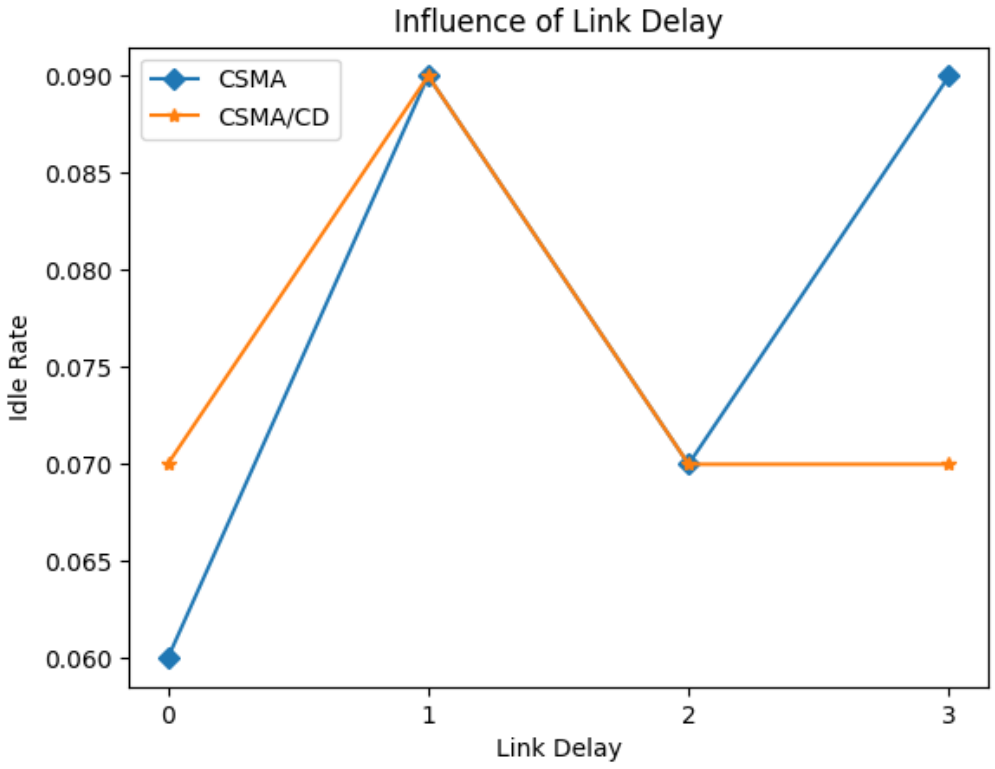


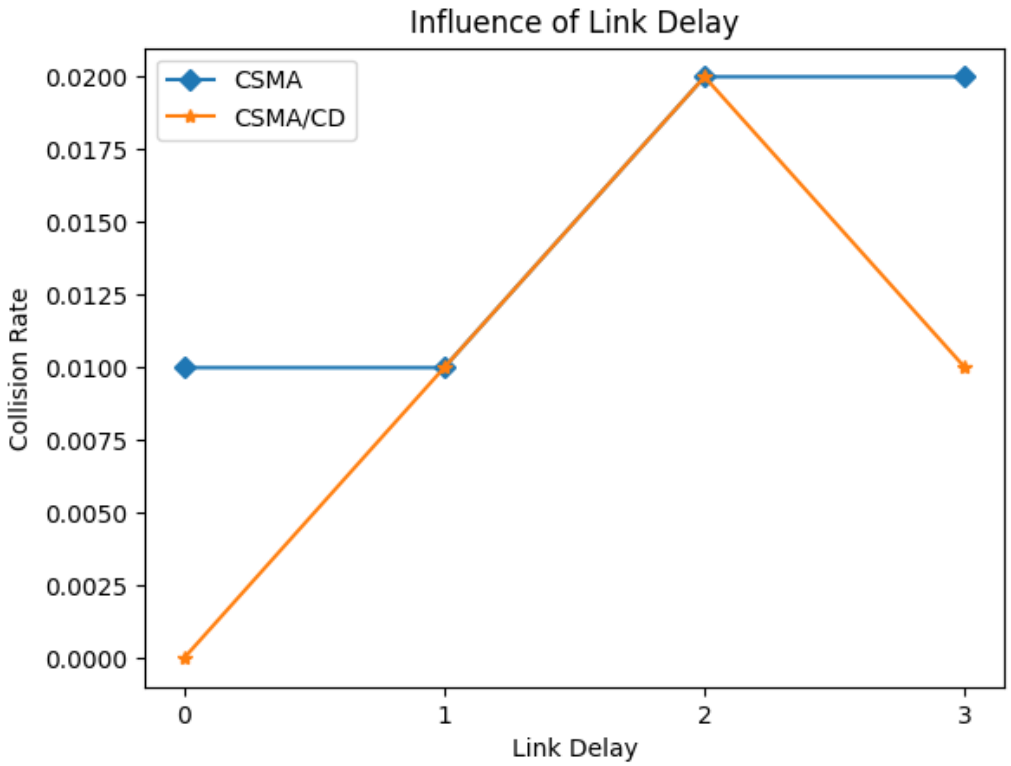



Influence of Packet Size
Collision Rate
Packet Size
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
ALOHA
Slotted ALOHA
CSMA
CSMA/CD

8. Link delay 變長會導致 host 在 sense medium 的時候延遲更嚴重，對當下 medium 的使用狀況判斷更不精準，所以 success rate 會有下降的趨勢。






Influence of Link Delay
CSMA
CSMA/CD
Collision Rate
0.0200
0.0175
0.0150
0.0125
0.0100
0.0075
0.0050
0.0025
0.0000
0
1
2
3
Link Delay