NSCAP

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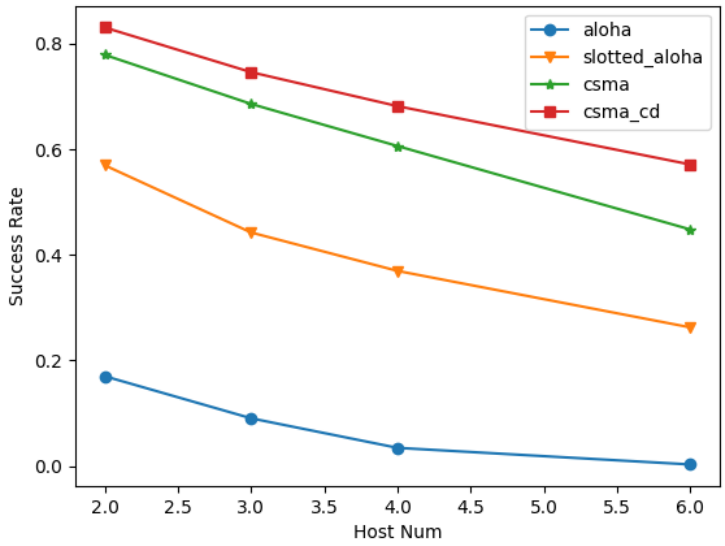
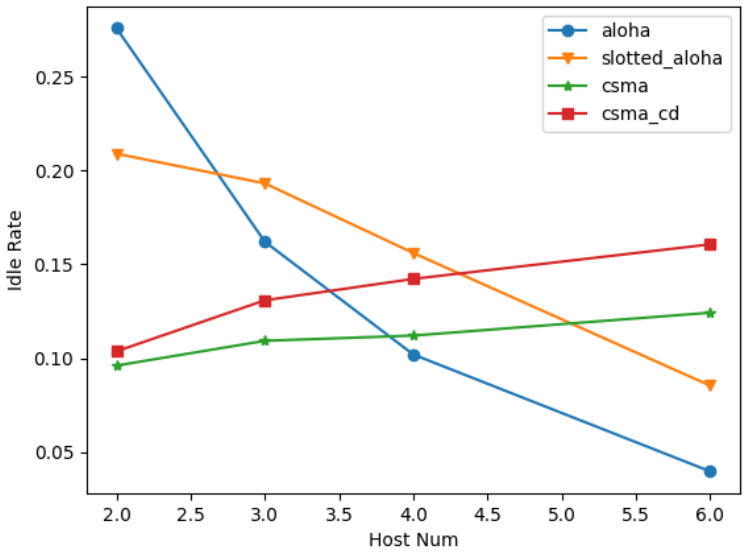
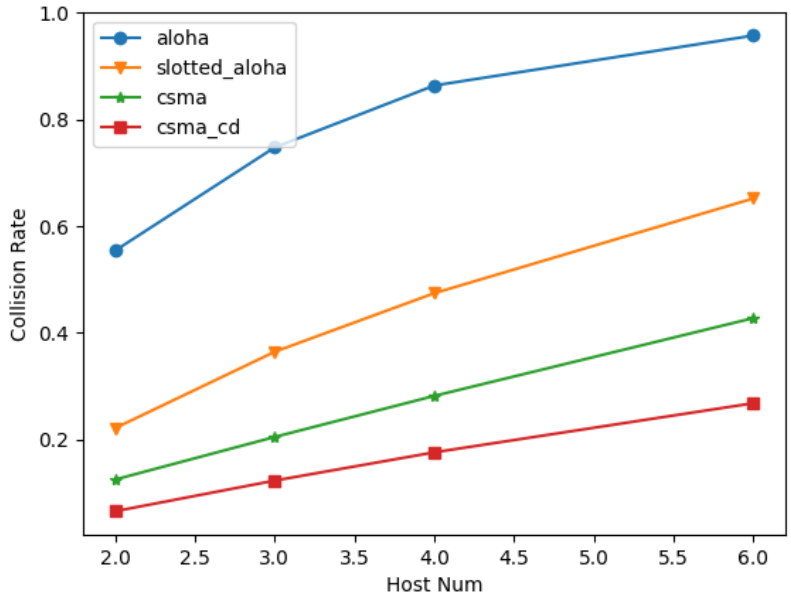
Questions

1. Apply the following settings in all methods and plot the results.







如同預測結果，Success Rate 與 Collision Rate 的結果剛好反過來，而呈現的數據，csma_cd 的 Success Rate 從 0.85 降到 0.6 而 aloha 則從 0.2 幾乎降為 0，不管是 Success Rate 或 Collision Rate 都與預測吻合。

2. Define two expressions, one for calculating "max_colision_wait_time" and another for calculating "p_resend", which should both include a coefficient parameter c ≥ 1 and other parameters.

```
if max_colision_wait_time is None:
    self.max_colision_wait_time = self.packet_time * self.host_num * coefficeint
else:
    self.max_colision_wait_time = max_colision_wait_time # ALOHA, CSMA, CSMA/cD 重新發送封包的最大等待時間

if p_resend is None:
    self.p_resend = 1/(self.host_num * coefficeint)
else:
    self.p_resend = p_resend # slotted aloha 每個slot開始時，重送封包的機率
```

Max_collision_time 的部分，我預設接下來的時間如果其他 host 也剛好要傳封包，那就是所有 host 封包平分時間，所以 max_collision_time = packet_time * host_num。

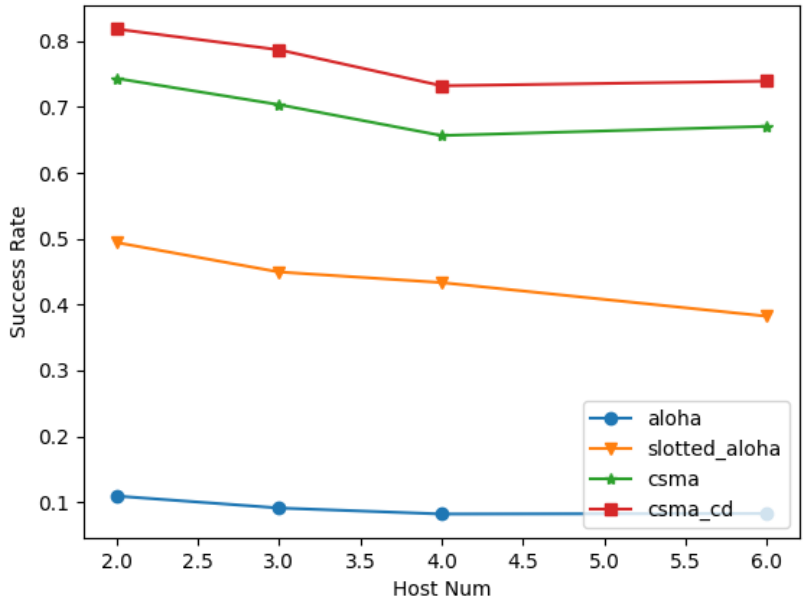
至於 p_resend 我用查到網路上的公式

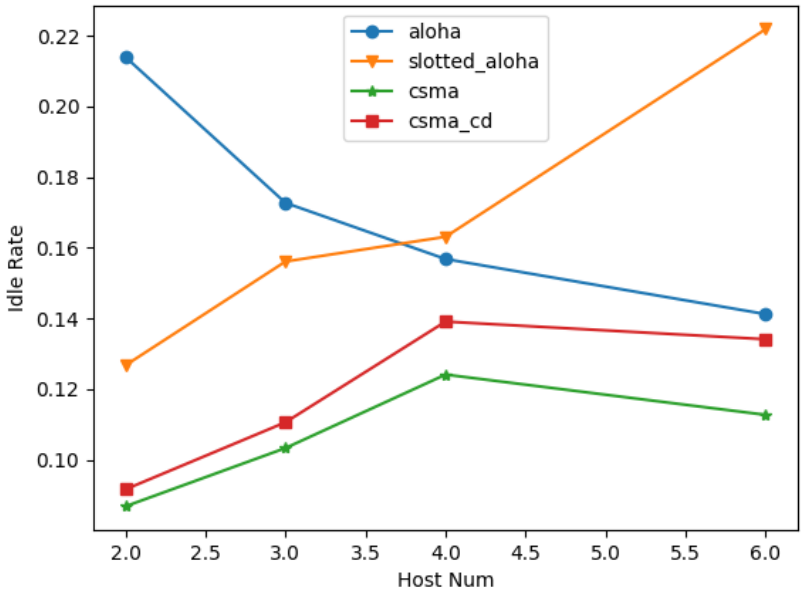
$$\Pr[\text{Success in a slot}] = Np(1-p)^{N-1}$$

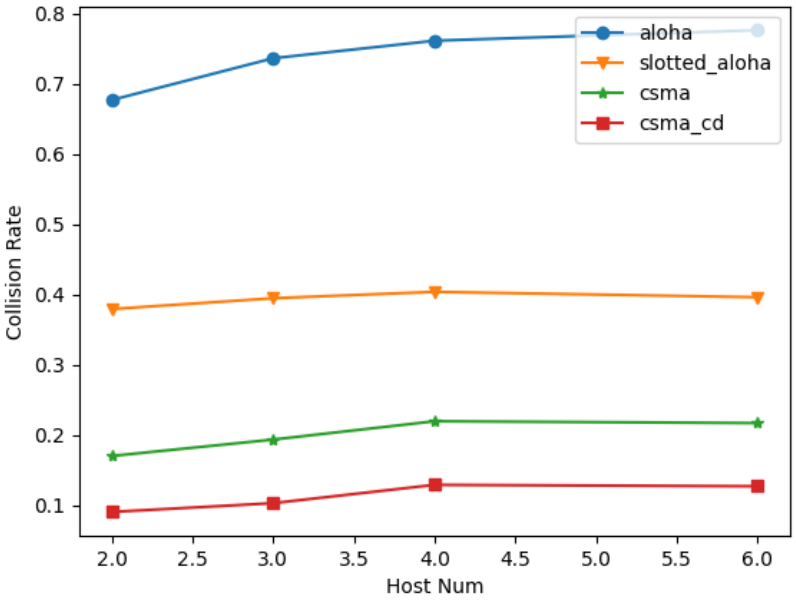
在微分後可以發現 p = 1/N 值會 = 0，剛好也可以求出最大值。

3. Redo the simulations from question 1 using the updated settings for all methods.

下面是模擬出來的結果，基本上跟助教的投影片上結果一致。

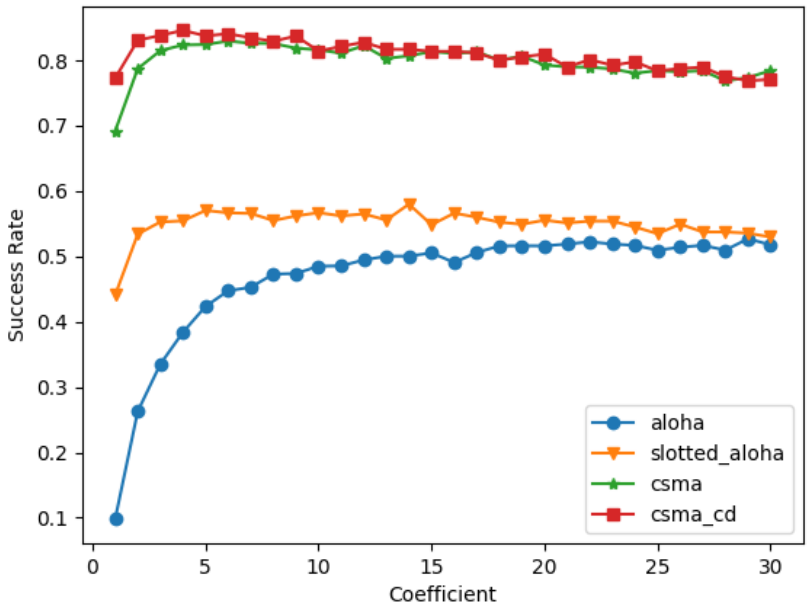


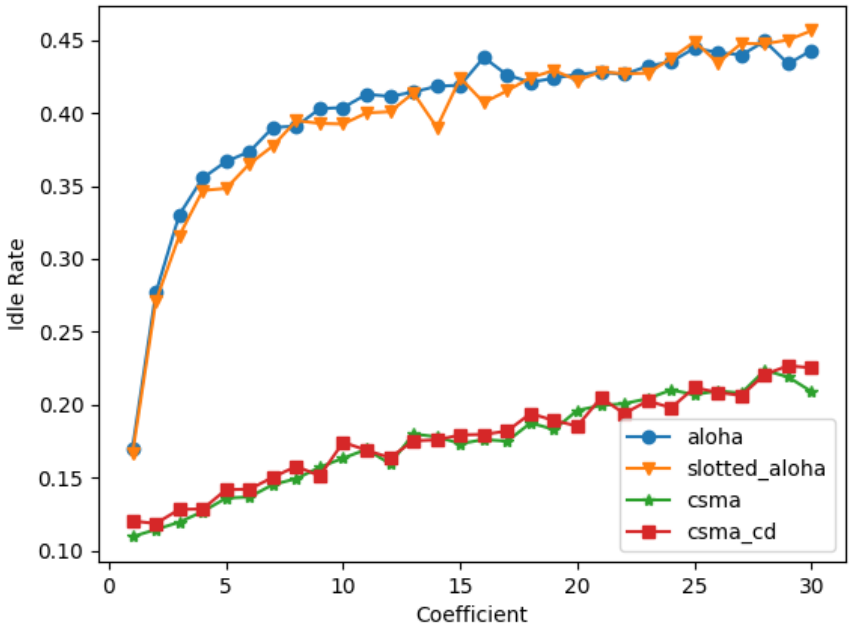


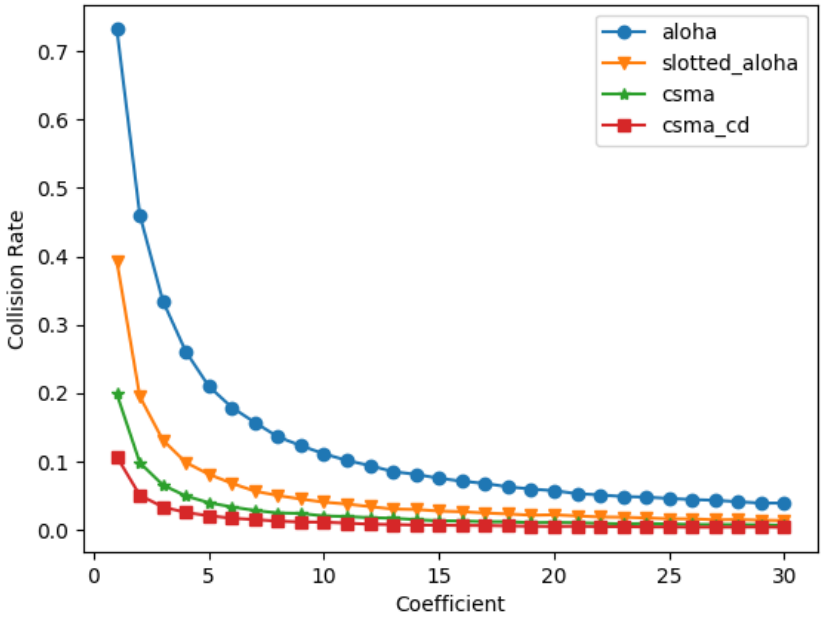


可以發現 Success Rate 的排序與問題 1 一致，但隨著 Host num 的上升，Success Rate 表現下降率不會那麼大了。

4. What's the influence of "coefficient" in all methods.
   Apply the following settings.

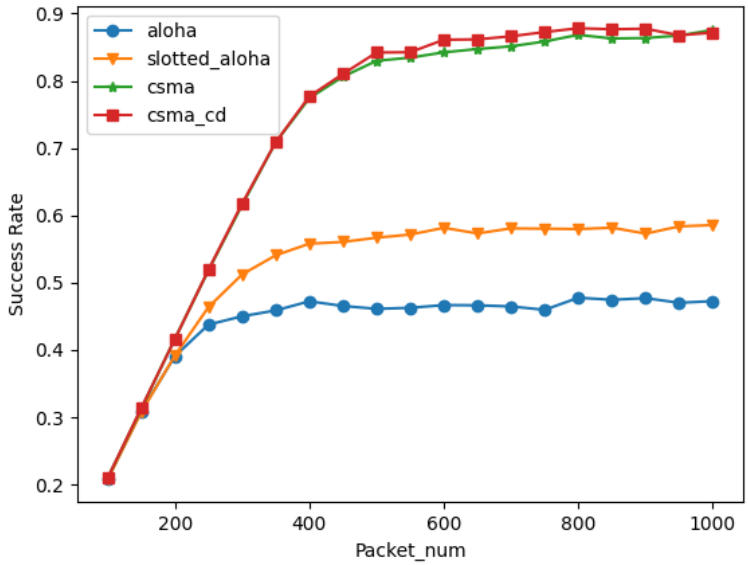


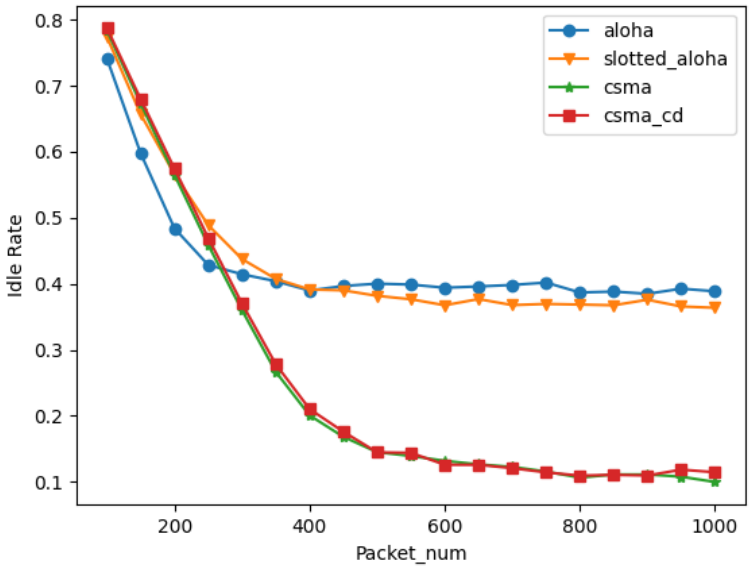


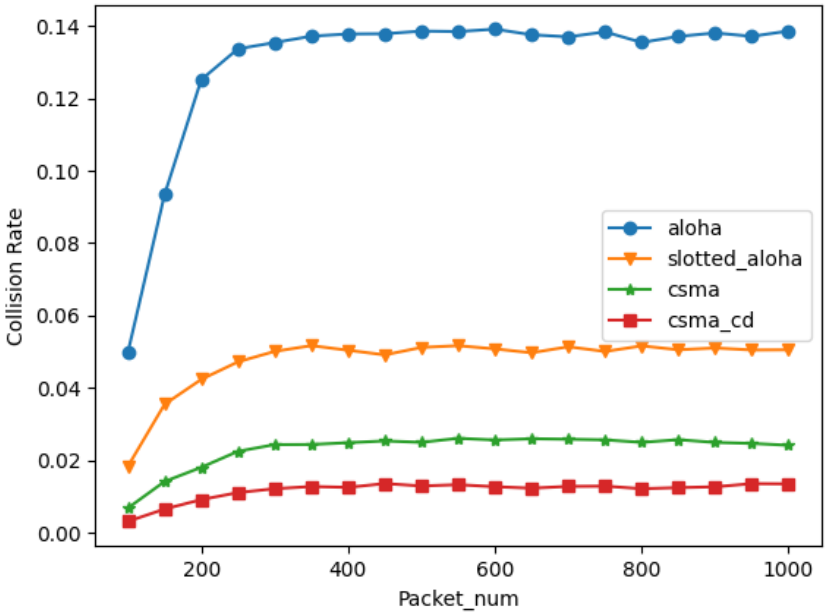


可以發現除了 aloha 其他的 Success Rate 高峰都在 C=4 或 5 的時候，C 的增加代表 resend 之後撞到的機率下降，所以 Collision Rate 四者皆下降，但也同時代表 Idle Rate 也會提高，因為有更長的 max_collision_time。

5. What’s the influence of “packet_num” in all methods. Apply the following settings

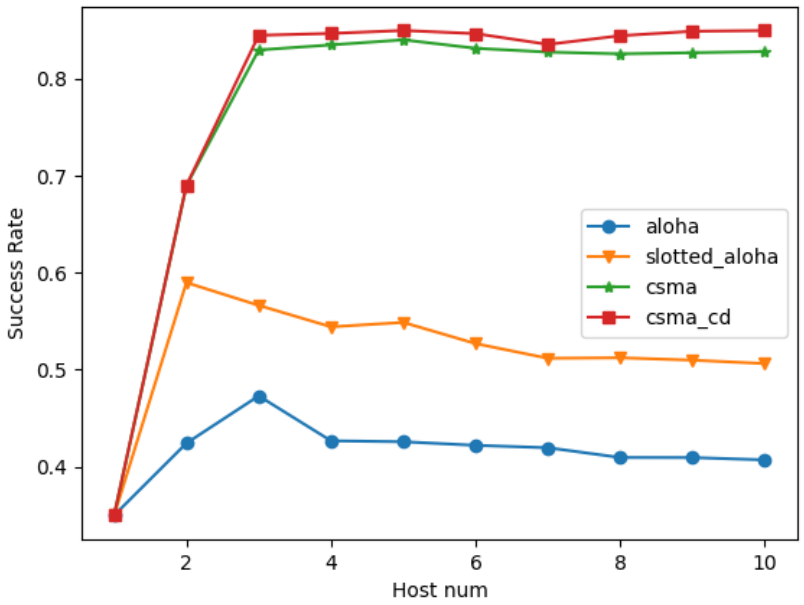


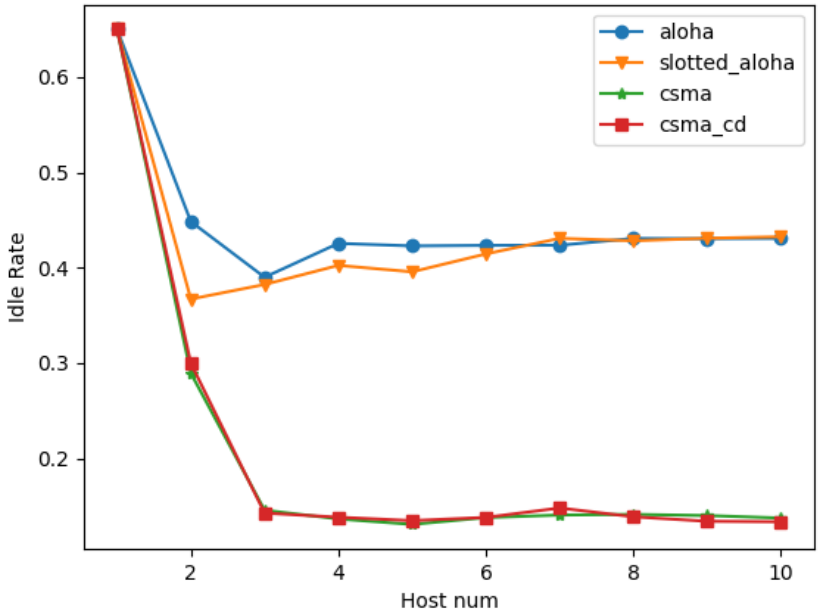


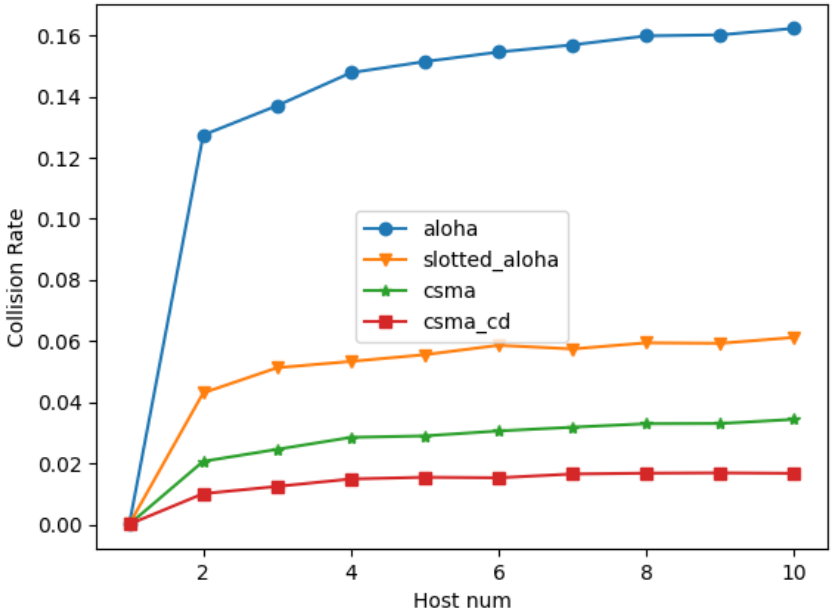


當 packet_num 數量提高也代表有更高的機率會 collision，但因為 csma 和 csma_cd 都是發送前會先監聽，所以可以更有效的避免碰撞，成功傳輸，而 slotted_aloha 碰撞也會在同一個 slot 裡，而不是像 aloha 有可能一直連續碰撞。

6. What’s the influence of “host_num” in all methods. Apply the following settings.

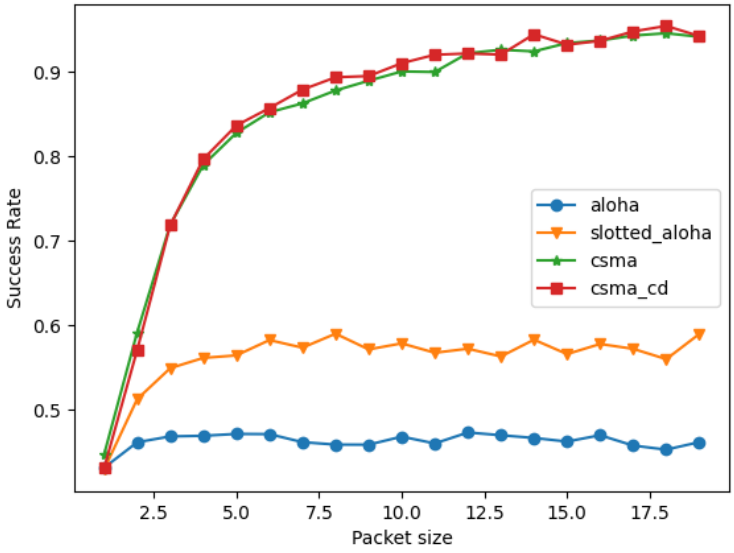


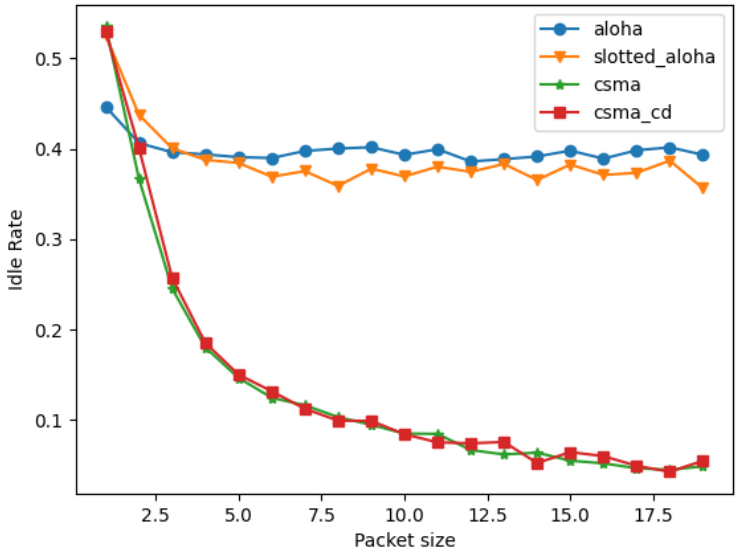


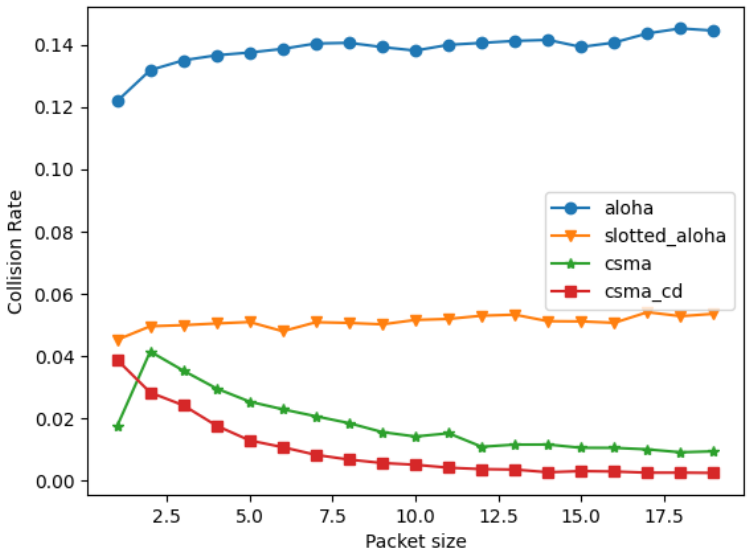


Slotted_aloha 的 Success Rate 在 host num = 2 的時候有一個高峰，他跟 aloha 會隨著 host_num 的增加而 Success Rate 下降，相反的 csma 和 csma_cd 並不會隨著增加而下降，Collision Rate 則是 aloha 上升的最快。

7. What’s the influence of “packet_size” in all methods. Apply the following settings.

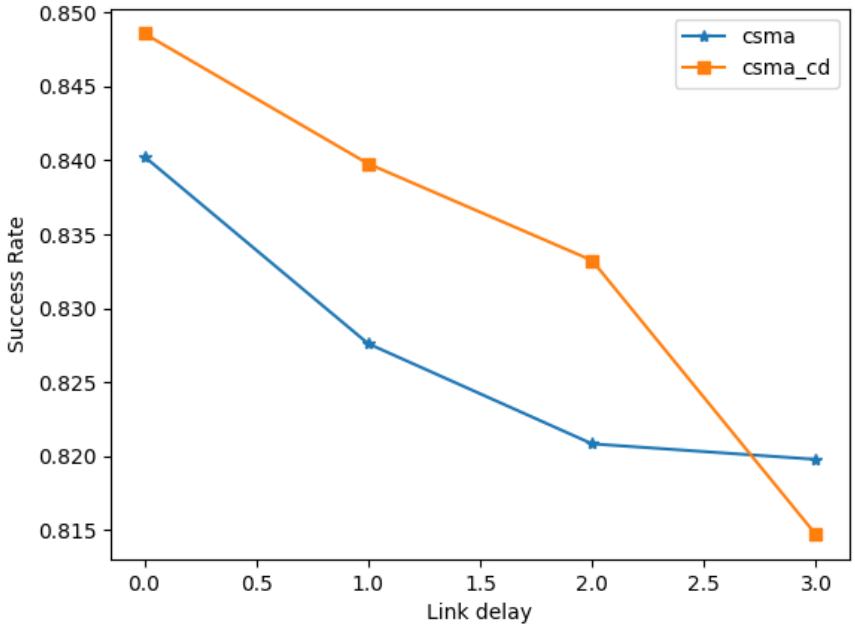


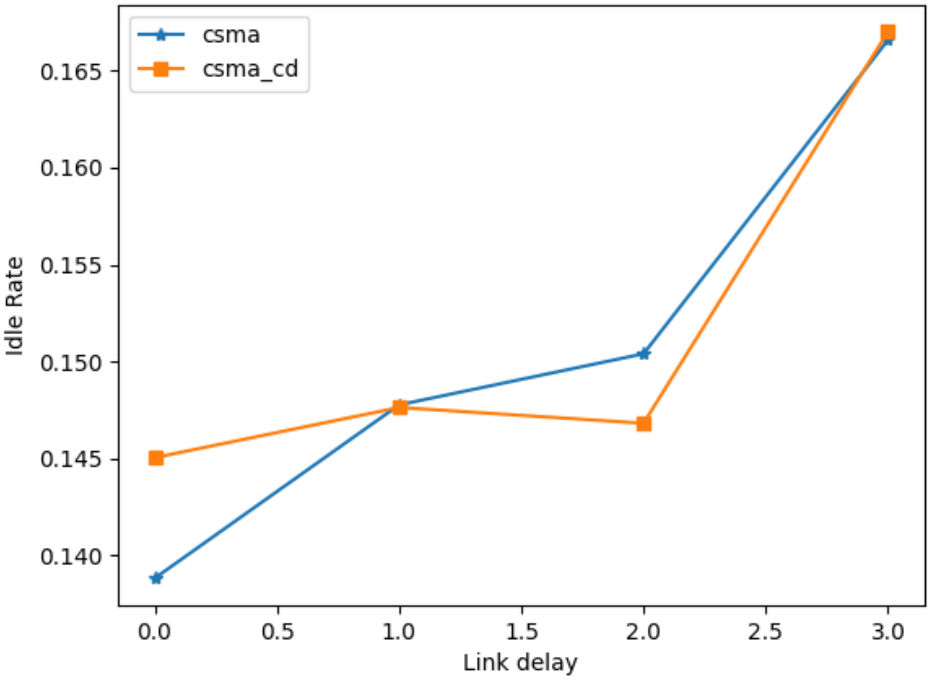


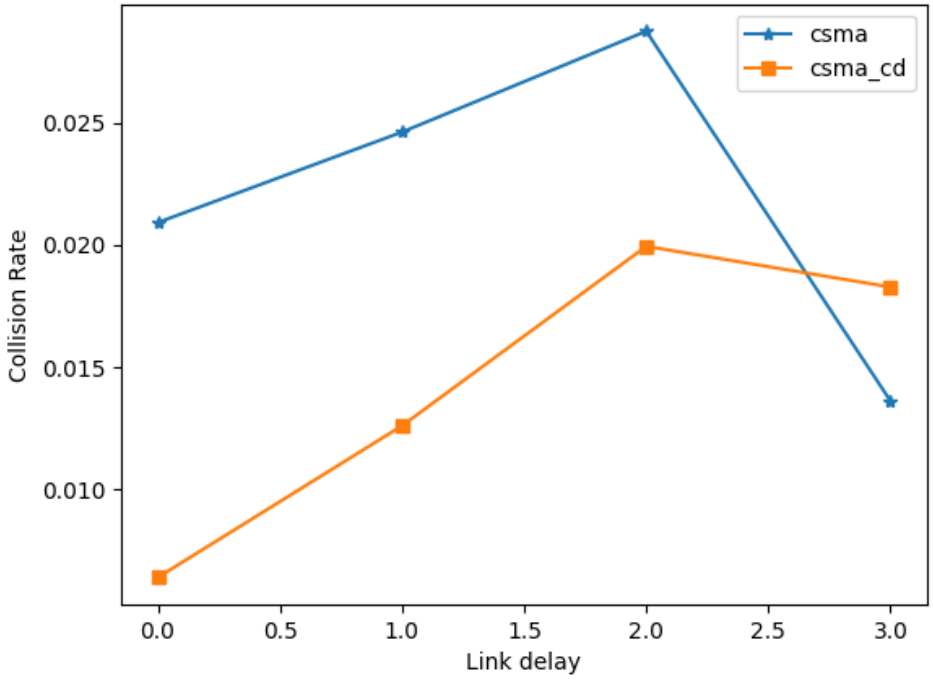


csma 和 csma_cd 在 packet_size 增加後，相比於另外兩種，Success 更容易達成，同時間代表 Idle Rate 也會跟著下降。

8. What’s the influence of “link_delay” in CSMA and CSMA/CD?







我的結果大體上的走勢是對的，但當 link_delay = 3 的時候兩者的表現都會突然變好，我覺得可能要像 Q4 到 Q7 一樣多設幾個 link_delay 的值去觀察走勢，要不然其實我每次測出來的值也都是會有誤差的。