

MATH96012 Project 1

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November 1, 2019

Part 2

As we can see the alignment seems to stabilise after an initial period of randomness, but this very much depends on A . When A is 0.2 we can see that the system is very stable tending towards 1, with very little randomness. But as A increases to 0.8 we can see that the alignment tends to lower value and is far more random, to the point where it appears to stop tending towards a value. A physical interpretation of this is that A represents noise and so as A increases, the particles have less of an effect on each other and so are less likely to stick together (stay in a group). Resulting in more random movement and be less like to stay aligned, hence the randomness in alignment.

The randomness after system seem to stabilises represent particles in a kind of equilibrium state, but then breaking apart whether its because they hit a boundary or particles move off. The particles then start to re-stabilise after a while.

These views are reinforced for figures 3 and 4, where we look at the variance of the alignment across S samples for each value of A . As we can see the peak variation occurs around $A=0.63$ with a Bell shaped curve. Which is unexpected as we would think increasing noise(A) would decrease alignment, a possible explanation is that particles are constantly out of alignment and never stick together so there is less variance in alignment. Hence a Bell shaped curve.

All figures shown on pages below.

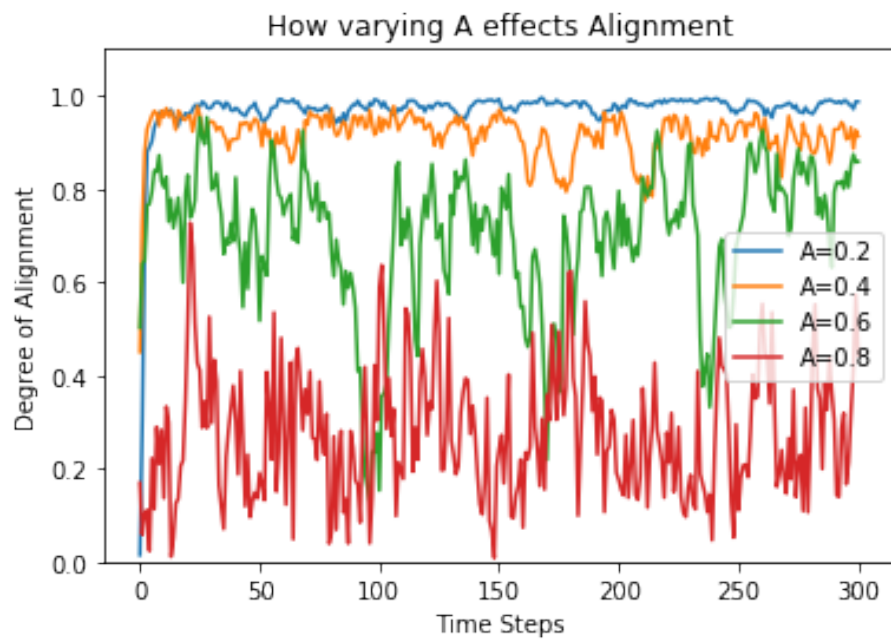


Figure 1: How varying A effects Alignment

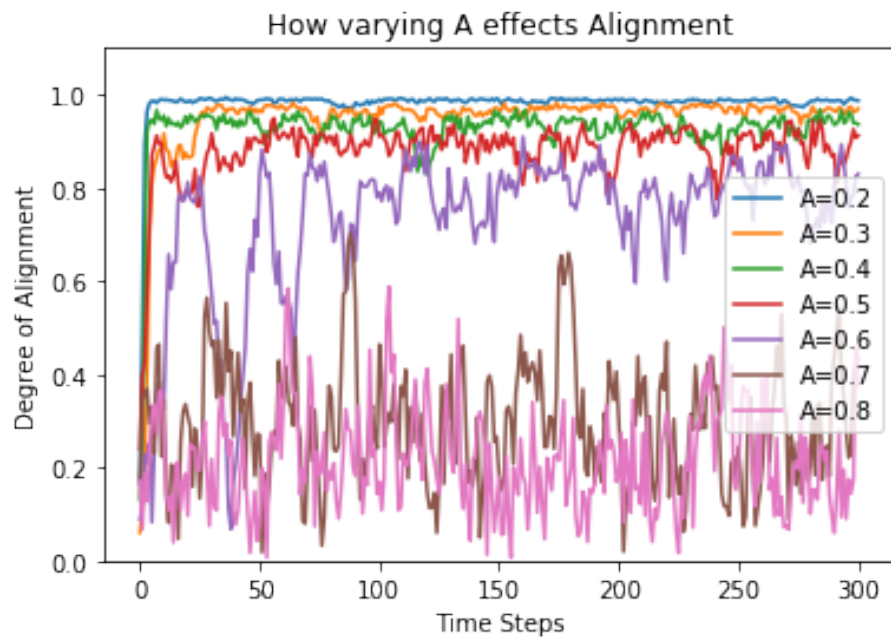


Figure 2: How varying A effects Alignment

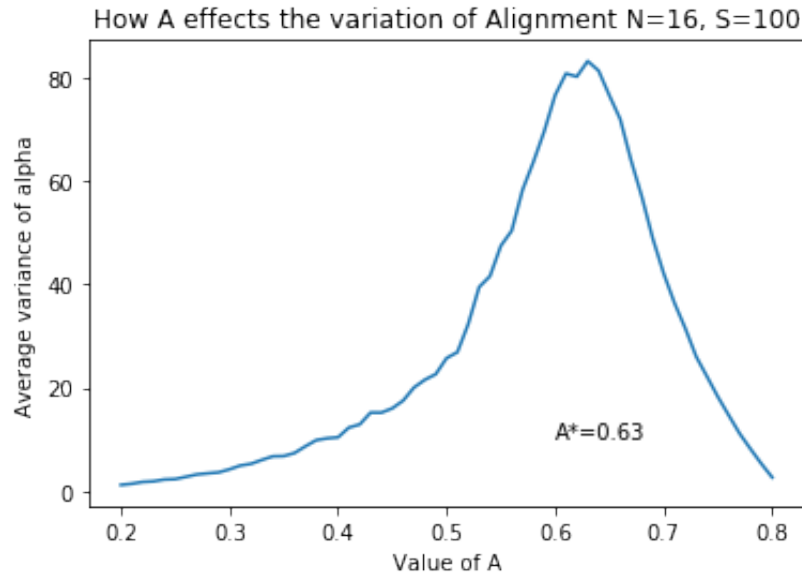


Figure 3: How varying A effects variance of Alignment, N=16, L=4, S=100

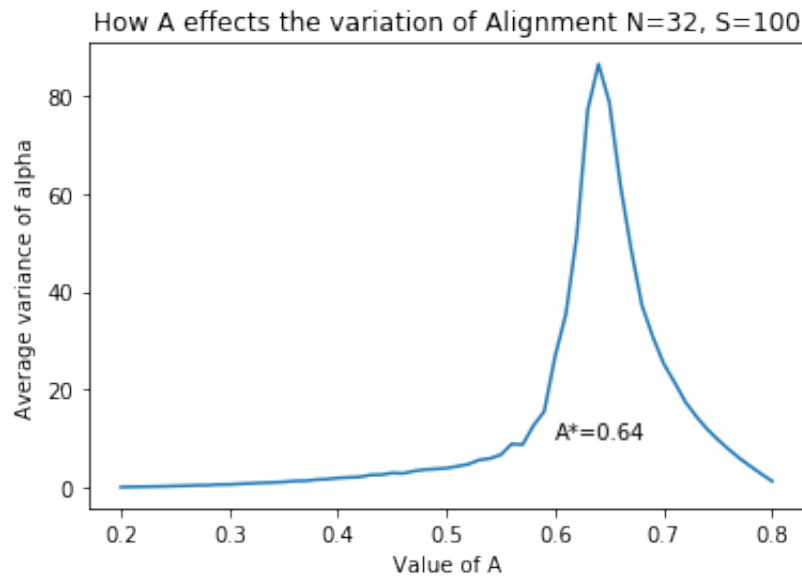


Figure 4: How varying A effects variance of Alignment, N=32, L=4, S=100