# Cahn-Hilliard equation: 1- and 2-D codes

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You have been given a code written in C for solving Cahn-Hilliard equation in 2D using finite difference technique with periodic boundary condition implmenetation. Modify the code, or, write codes based on the given code to do the following:

1. Change the initial profile such that one third of the domain in the middle has composition unity and the other two thirds (one third on either side) has composition zero. Allow the system to equilibrate.

2. Write functions which will calculate the interfacial energy and use it to calculate the interfacial energy for the Problem 1 above. Vary the parameters kappa and A, and plot the changes in interfacial energy with these parameters.

3. Change the initial profile such that there is a circular region of composition unity at the centre of the domain with composition zero elsewhere. Allow the system to equilibrate. For different radii of the circular region, find out the composition at the centre of the precipitate and plot the change in composition from the equilibrium value of unity as a function of size of the precipitate.

4. Write a 1-D code to solve Cahn-Hilliard equation using finite difference technique with periodic boundary condition.

5. In the 1-D code, introduce a sinusoidal composition profile and study the time evolution. Plot the rate of growth of the profile as a function of wavelength.

6. In the 1-D code, introduce two interfaces by making one third of the region in the centre composition unity and the rest of the regions with composition zero. Define the interface width as the distance between the intersection of the straight line with composition lines of zero and unity with the slope of the straight line taken from the point of composition of 0.5. Plot the change in interface width with changing kappa and A.