CONTROLLING THE SHAPE OF CLUSTERS WITH A MACROSCOPIC FIELD

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Idea: control of shapes in non-equilibrium clusters

\[ F \] macroscopic control parameter

- e.g.: electric field, temperature gradient...

**Method 1: Dynamic Programming (DP)**

**Method 2: Reinforcement Learning (RL)**

Compute the optimal policy on the state space. This problem can also be seen as the optimization of the first passage time on the graph of the dynamics. Requires complete knowledge of the governing laws of the environment.

Learn from experience and find the optimal policy. This method is closer to what could be done in an experiment. Requires continued observation of the evolution of the environment.

**Case study: electromigration-driven islands**

Electromigration: current-induced mass transport that arises from a momentum exchange between conducting electrons and island atoms.

**Perspectives**

Experimental application on colloids seems quantitatively reasonable.

Consider non mass-preserving processes.

Consider other models to describe different interactions:
- Magnetic interactions
- Acoustic interactions (Bjerknes force)
- Interactions with light (optical binding)

Functional metamaterials (colloidal robots):