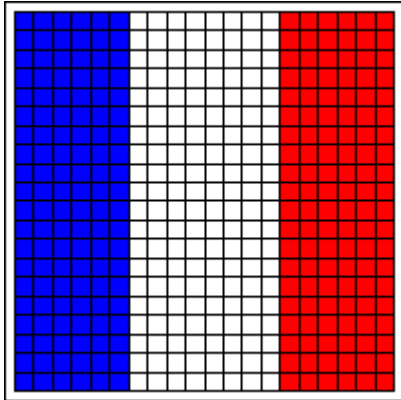


## Miscellaneous models

### French Flag: Morphogen gradient



Wolpert's French Flag

#### Introduction

This example shows Wolpert's classical French Flag model. Depending on the local concentration of a morphogen, cells adopt one of three cell types based on internal thresholds.

#### Model description

The model sets up a morphogen gradient in the x direction PDE. Note that no diffusion is used, since we use the steady-state solution of diffusion.

The cells in `CellType` register the (average) local morphogen concentration using `PDEReporter`. Based on the specified threshold values, they choose an identity `I` as defined in the Equation.

Note that this model is not time-dependent. Time is therefore set from `StartTime 0` to `StopTime 0`.

#### Things to try

- Change the physical length of the domain by editing `Space` → `NodeLength` that controls the physical size per lattice site.
- Change the model such that the morphogen gradient is set up by production and diffusion, using `Diffusion` and a `System` with `DiffEqn`. That is, change the model into a time-dependent model.

#### Model

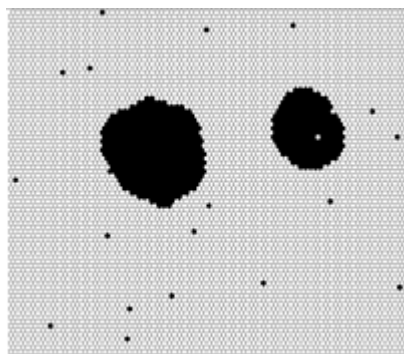
h FrenchFlag.xml |h

```
extern>http://imc.zih.tu-dresden.de/morpheus/examples/Miscellaneous/FrenchFlag.xml
```

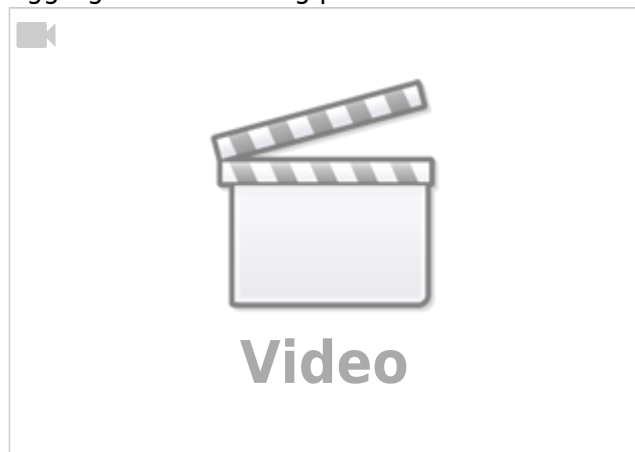
In Morpheus GUI: Examples → Miscellaneous → FrenchFlag.xml.

---

## Particle Aggregation: FlipCells



Aggregation of moving particles



### Introduction

This models approximates an interacting particle system (IPS) model of particle aggregation. Each black dot represents a particle that moved due to spin flips with random neighbors. The particles perform random walks in which the probability of moving depends on the number of neighboring cells.

### Model description

Each lattice site (white or black) counts the number of particles (black neighboring sites) using a `NeighborsReporter`.

The probability of movement of each particle is made dependent on its number of neighbors by using it in the `Condition of FlipCells`. When this condition is satisfied, the particle changes positions with a random neighboring lattice site.

A PopulationReporter is used to return the fraction of isolated black particles. This number is logged and plotted using the Logger.

## Things to try

- Change the parameter p.

## Model

h ParticleAggregation.xml |h

```
extern>http://imc.zih.tu-dresden.de/morpheus/examples/Miscellaneous/ParticleAggregation.xml
```

In Morpheus GUI: Examples → Miscellaneous → ParticleAggregation.xml

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