Generations in Bounded Confidence

Pascal Steger

April 30, 2014

Contents

1 Abstract

I investigate the evolution and stability of an agent based model for opinions in a group of agents with a finite lifetime.

2 Motivation

The bounded confidence model describes the way an ensemble of agents converges on a common opinion, or several final opinions.

Effects that cannot be described with this model is long-time change of opinions, as is e.g. seen in human societies over several generations.

One way to mitigate this problem is by including said generations in the model. I implement this idea by adding one additional internal parameter for an agent, its age.

I propose as hypothesis that as old agents disappear to be replaced by young, unbiased agents, a shift in the overall opinion will occur. I will determine what model parameters have the most influence and how the timescale for a considerable shift of opinion compares to the lifetime of single agents.

3 Implementation

I model agents $i \in [1, N]$ with two internal parameters: an opinion o_i and an age a_i.

I use several sets of initial conditions:

1. consensus: All agents have a common opinion $o_i = c \in [0, 1]\,\forall i \in [1, N]$. The age is uniformly distributed. This setup enables us to determine the timescale after which a consensus is lost due to replacement of old agents with new agents having a uniform opinion distribution.

2. uniform field: The opinions are uniformly distributed, and so are the ages. This setup serves to determine the criteria for consensus finding.

I introduce a social distance d between two agents encompassing opinions o_i, physical positions x_i (2D on a lattice, or 3 dimensional, or any appropriate social distance), age a_i. In each timestep, two random agents meet. They interact based on two possible rules:

1. if the distance between them is smaller than a parameter ε with a strength parameter ζ.

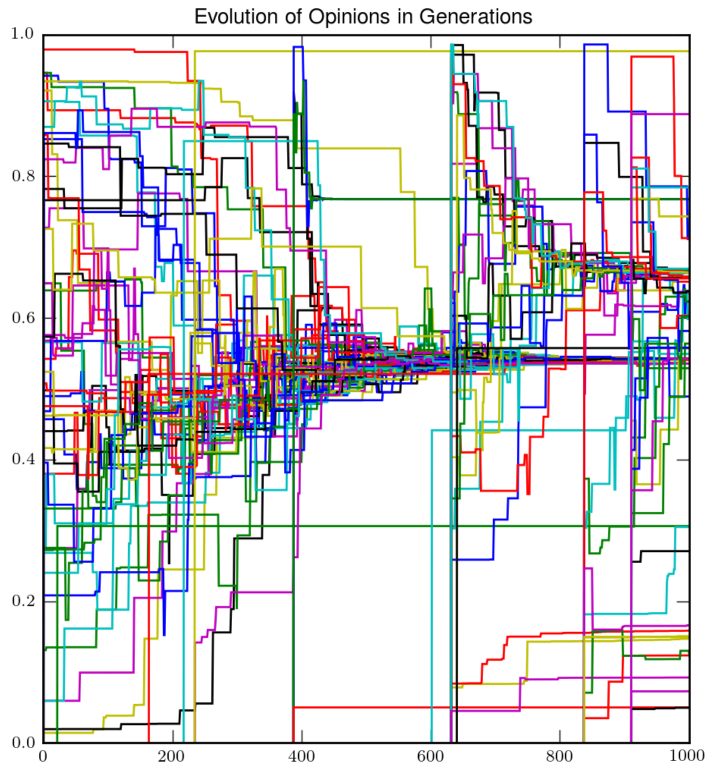
2. always, but the strength parameter is decreasing with increasing distance: $\zeta = \zeta_0/g$.

The interaction is based on the bounded confidence model

$$o_i(t+1) = o_i(t) + \zeta \cdot (o_j(t) - o_i(t)) \quad (1)$$
$$o_j(t+1) = o_j(t) + \zeta \cdot (o_i(t) - o_j(t)) \quad (2)$$

4 Preliminary Result

For the uniform field, and $\zeta = 0.5$ with the distance-dependent interaction rule, I get the evolution shown below. We can see the initial convergence, and the appearance of new agents with time (vertical lines mark births). A second "opinion peak" is forming at timestep 800, with mostly young agents, but



some old ones as well.

5 Further Investigations

I will

- develop a metric to determine the number of concurrent stable opinions
- plot the timescale between new opinions as a function of mean lifetime of the agents divided by the frequency of new births
- run a simulation starting from a consesus and compare it with the analytic treatment