Defining extremism

Extremism definitions in opinion dynamics models

André C. R. Martins
GRIFE – EACH
Universidade de São Paulo
https://sites.usp.br/sistemascomplexos/
http://www.vieses.com

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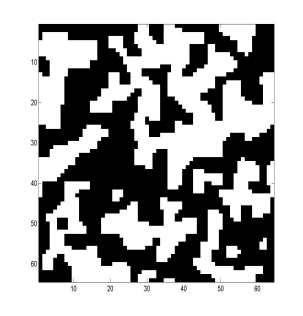
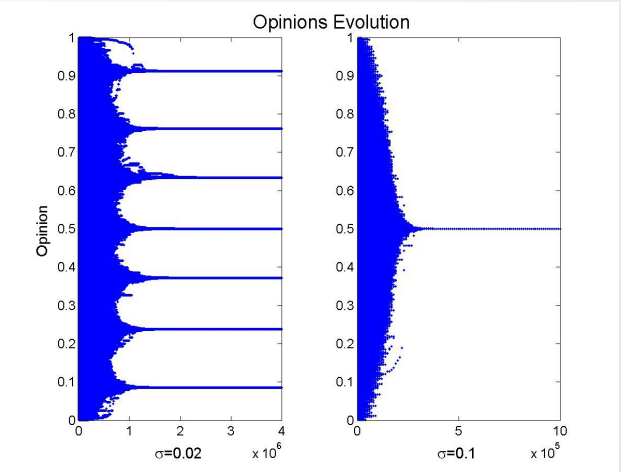
Traditional opinion models and extremism



- Discrete
  - Good for choices
  - Describes actions such as terrorism (do or not do is binary) very well
  - Tipically, no strength of opinions
- Continuous
  - Opinion strength
  - Not so natural to talk about actions
  - Values at the end of range: always extremists?

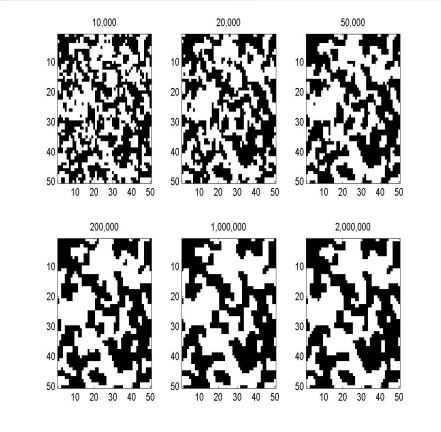


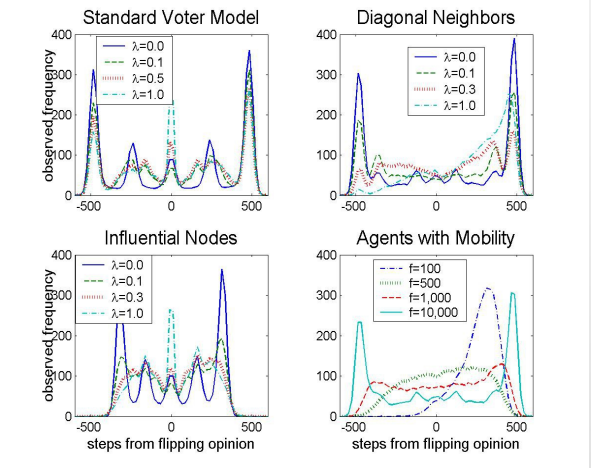
Opposing concepts

- Discrete models: inflexibles → inability to change opinions
- Continuous models: end of range → distant from the opinion of others, but can still change as well as anyone eles.
  - It is possible to change definitions here to inability to learn, but they are conflicting.
- Both cases lack a direct link to actions

How to explore

- We need a framework with choices, strength of opinions, communication and action.
- First attempt:
  - Original CODA model: doi.org/10.1142/S0129183108012339
    - Probability as opinion strength
    - Observed choice: action with highest probability
    - Update rule based on observation: Bayesian inspired





Framework

doi.org/10.1063/1.4759605

- The issue: variable x
- Opinion about the issue: distribution f(x)
- Communication: Functional A[f]
- Agent internal model dependent on best choice x*: p(A|x*)
- Update rule from the internal model: Bayes (or something else)
- Interaction rules: networks, etc.

Relation to traditional models

- Bounded Confidence results equivalent to a continuous update rule with some distrust: doi.org/10.1088/1742-5468/2009/02/P02017
- Discrete models recovered as a limit case of an extension where self-influence is considered by agents: doi.org/10.1016/j.physa.2013.10.009

  Also details
- Contrarians: doi.org/10.1142/S0219525910002773
- Inflexibles: doi.org/10.1103/PhysRevE.87.042807
- Trust: doi.org/10.1016/j.physleta.2013.07.007

Opinions and Networks

doi.org/10.1142/S0129183119500773

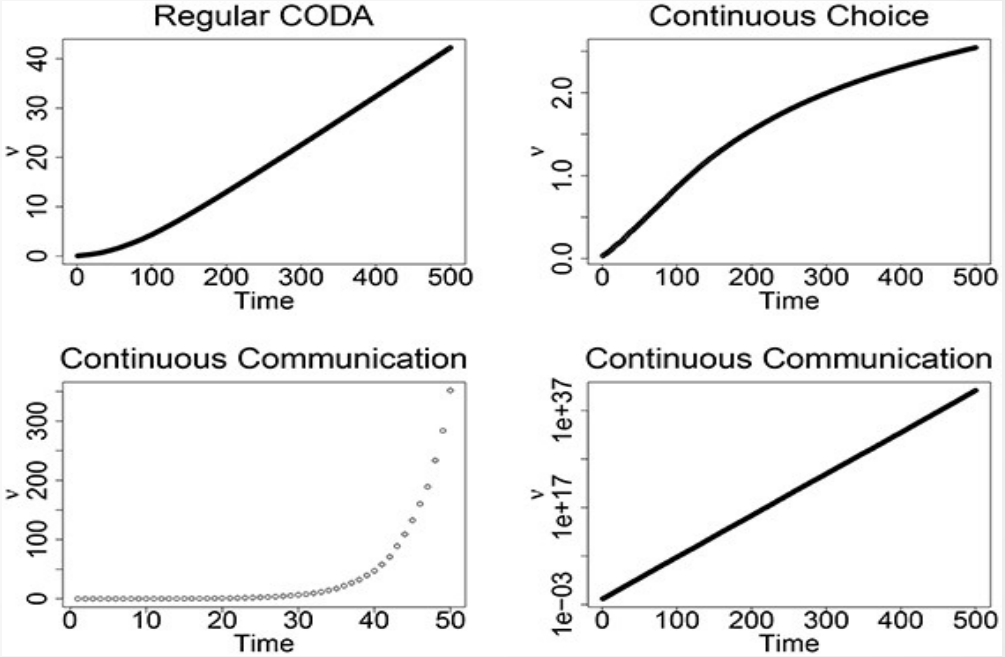
- Opinions evolve by CODA algorithm
- Network changes by using an energy function
  - Only spatial components: $H = \beta \sum_E d_{ij}$
  - Spatial and opinions: $H = \beta \sum_E (d_{ij} - J \sigma_i \sigma_j)$
- Implemented using Metropolis:
  - Randomly choose an edge to be eliminated and a new one to be created. Accept change with probability

$$P = e^{-\Delta H}$$

Ways to implement extremism

doi.org/10.3389/fphy.2016.00007

- Even a simple model of two choices raises questions:
- Communication:
  - Discrete
  - Continuous
- Mental models:
  - Wishers
  - Mixers
- Probability of being right can be non-extreme even when effort to change is the same.



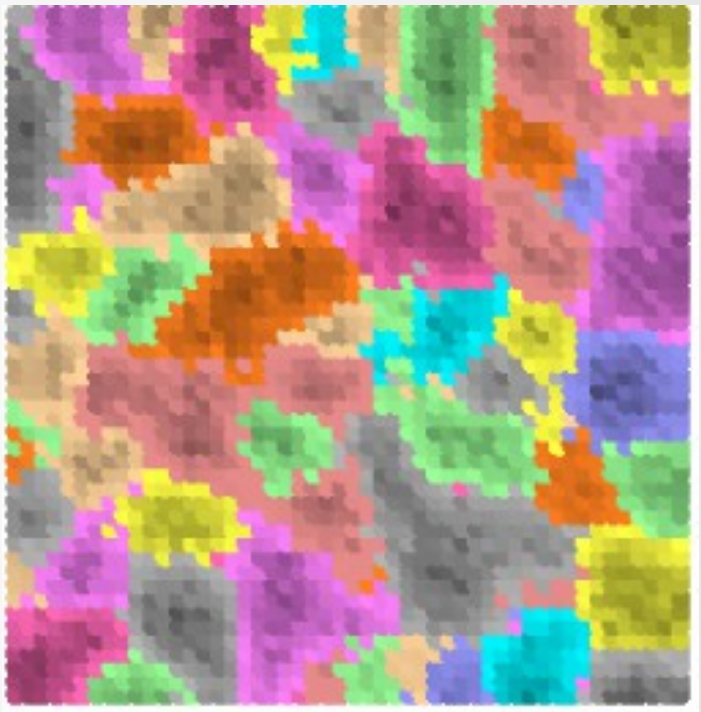
CODA-inspired Bounded Confidence lessons

- Over a continuous range, the limits of the range are naturally seen as extreme.
- If certainty (BC threshold) is updated, agents can grow very sure over time:
  - Become inflexibles, discrete version of extremism
- What represents extremism better?

A model for M choices

doi.org/10.1140/epjb/e2019-100298-3

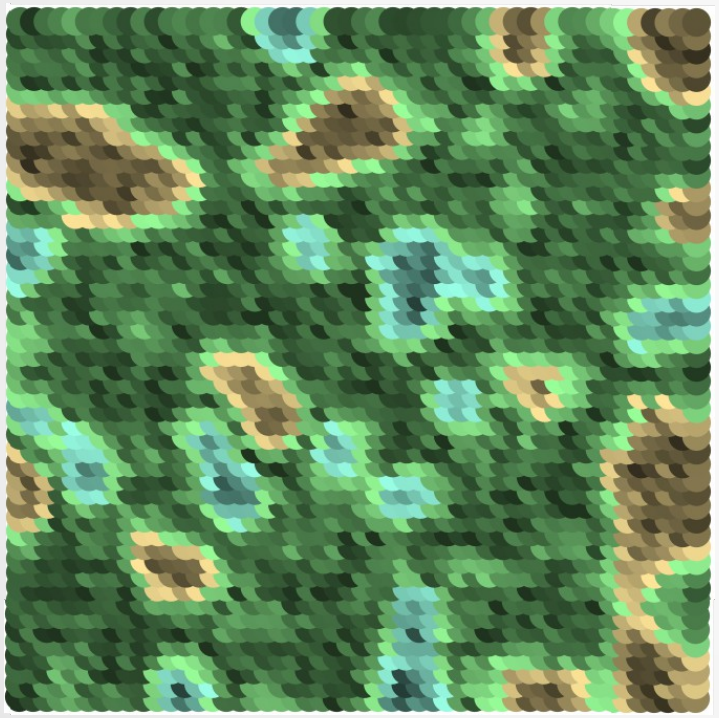
- Extending CODA for M choices
  - Each choice might be independent:
    - Formation of domains
    - Local reinforcement
    - Extremism is strength of opinion
  - Choices can also be aligned over a political axis.

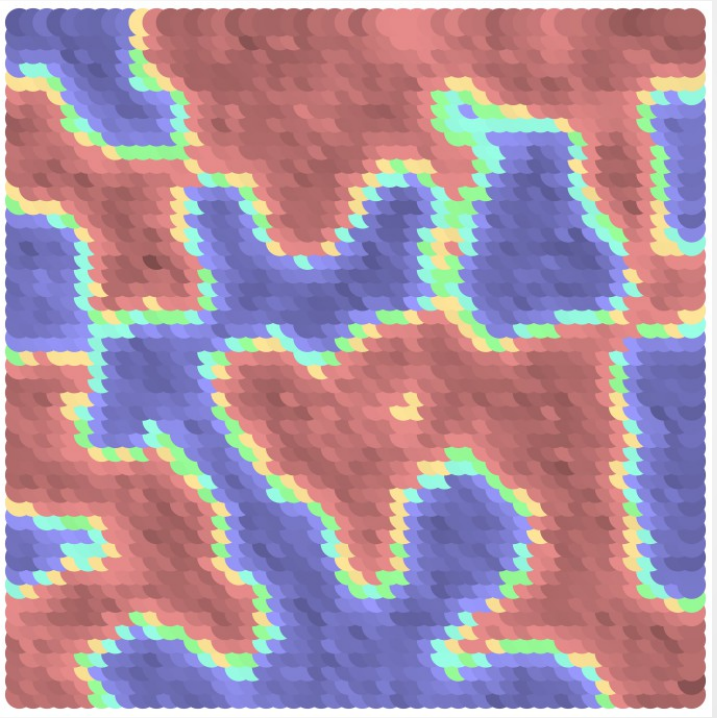


M choices over a one-dimensional issue

arXiv:2004.14548

- Suppose agents choose over the options: extreme left, left, centre, right, and extreme right.
- Outcomes depend on the mental model of the agents:
  - When agents assume that, if center is better, extreme positions should be much less probable, a strong tendency to central positions is observed.
  - When extremism is believed to be not so rare, agents tend to the extremes of the political spectrum.





Discussion

- In every case, agents do become quite certain about their choice: extreme centrists happen when we see large clusters that prefer the central position.
- Who are the actual extremists? Those at the end of the political range? Those who are too sure to change their minds?
- All those models lack one important feature, central in real world relevant problems: agents just choose and debate. Do we need to distinguish choice and action in our models?

Thank you