A computational approach to structural and cultural dimensions of social cohesion

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Outline

- Introduction
- Examples from literature
- Model
- Experiment
- Conclusion

Introduction

- Social Cohesion:
  - Issue under study for long (Durkheim, 1956).
  - Related to many phenomena of interest:
    - Community conceptualization (Wellman & Leighton, 1979)
    - Social exclusion and integration (Room 1995)
    - Embeddedness (Granovetter 1985, 1992)
  - Diffuse from a theoretical viewpoint.

Introduction

- Attempts to operationalize social cohesion
  - Social networks approach (specially well-suited to mathematical treatment of social interactions)

    (Wasserman & Faust, 1994) (Moody & White, 2003)

Introduction

- One particular approach in this line: *Group structural cohesion:*

  "the minimum number of actors who, if removed from the group, would disconnect the group" (Moody & White, 2003)

- Our goal: Extent structural approach with cultural aspects in a dynamical environment (role of social cohesion in collective action).

Examples from literature

- (Gould, 1991): Insurgent activity during Paris Commune 1871.
  - Interplay social networks and mobilization process.
- (Stark & Vedres, 2006): Evolution of Hungarian economical structure during the transition.

Examples from literature (II)

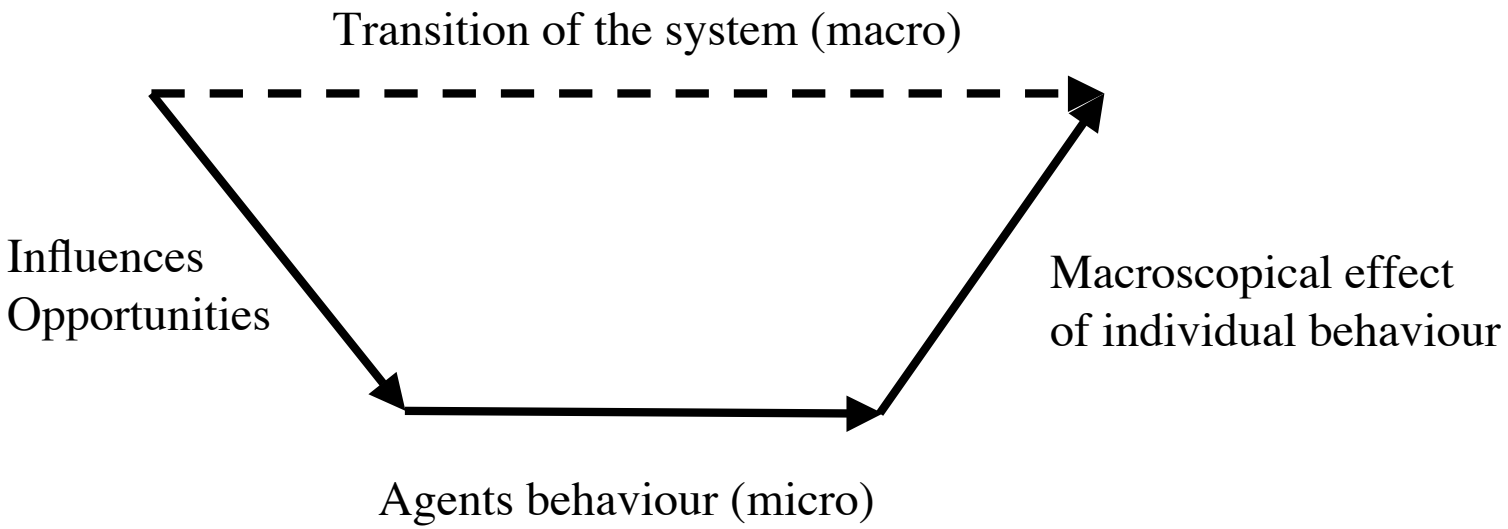
- (Murphy, 1957): Mundurucú's warfare behaviour.
  - Intercommunity cooperation in warfare facilitated by cross-cutting ties of residential and kinship affinity.

Examples from literature (III)

- Common features:
  - Focused on *processes*, not *static situations*.
  - Social structure.
  - Role of conflict level ('temperature' of social environment).

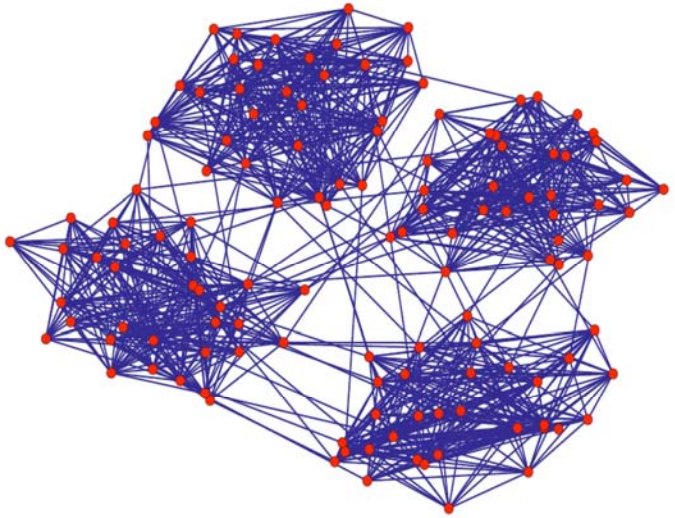
Examples from literature (IV)

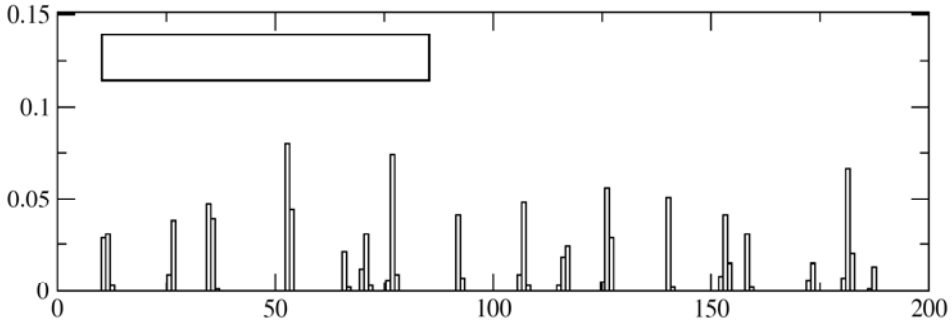
- Interaction of variables at different scales (Coleman 1990):



Model

- N, variable number of undirected (bidirectional) links.
- Each individual *i* has a h_i (opinion, positioning)





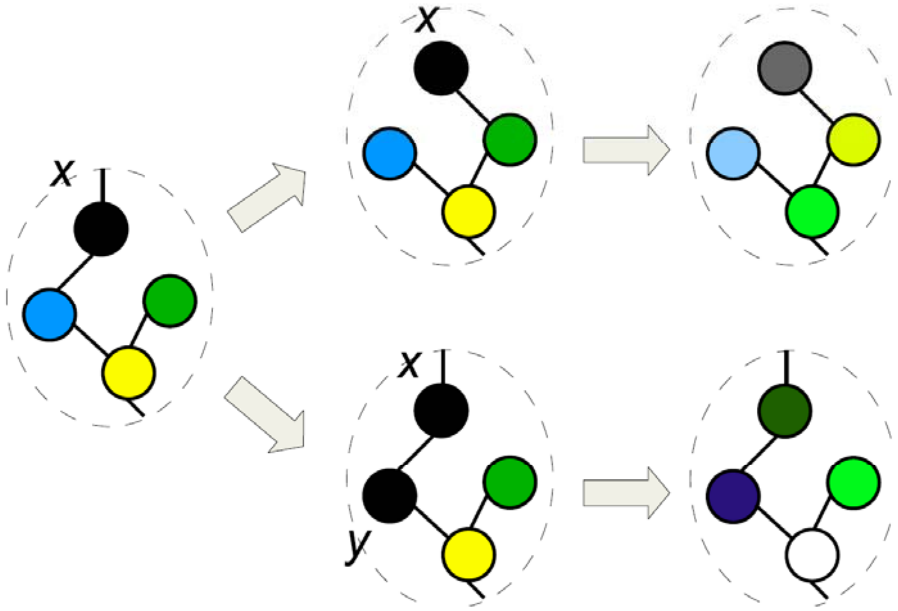
Model (II)

- Initial scenario
  - Social positions uniformly distributed
  - Network: Link probability dependent on homophily and the 'social distance' among agents (Boguñá *et al.*, 2004).

$$r(h_i, h_j) = \frac{1}{1 + [b^{-1} d(h_i, h_j)]^{\alpha}}$$

Model (III)

- Dynamics of the model (coevolution):
  - Imitation
  - Rewiring
  - Social Noise



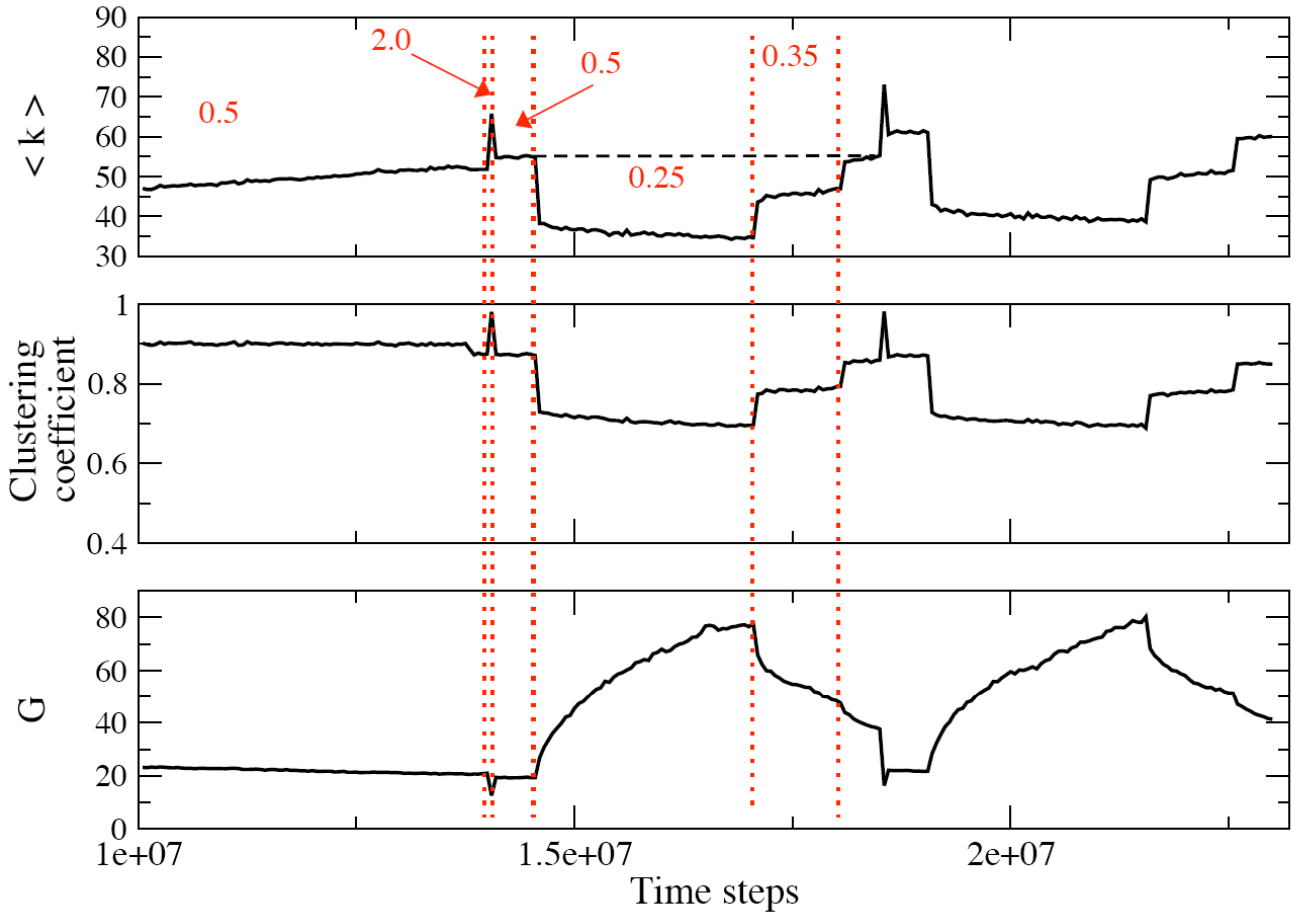
Model (IV)

- 2 additional requirements for the model:
  - Variations in 'social temperature': *b* parametre in probability of link.
  - Observable to signal changes on social cohesiveness: *average degree*, *clustering coefficient*, *number of isolated components or groups*.

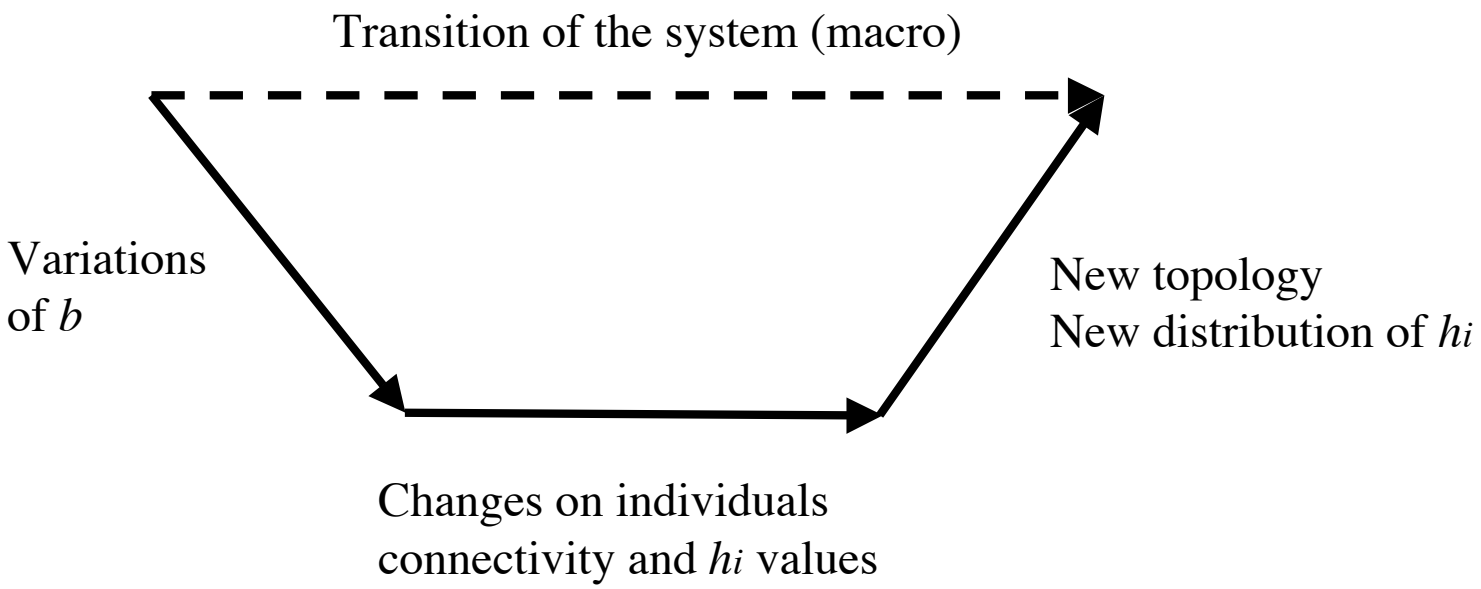
Experiment

- 2 crisis cycles (sudden increase of 'social temperature' followed by longer reactionary period).

Experiment (II)



Experiment (III)



Conclusions

- A simple model to explore a dynamic perspective of social cohesion.
- We observed interesting phenomena induced by changes on the 'social temperature'.
- Causal path among different topological levels.

- Initial conditions could be defined in a different way.
- Other observables for dynamical social cohesion.

Thank you for your attention!

Complementary material

- Effect of social noise