The roundtable : an agent-based model of conversation dynamics

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Empirical observations

- Conversations have a finite number of speakers, and their size can fluctuate over time: *Size is a global indicator of conversation dynamics.*

- A single conversation can **suddenly** split into two conversations (schism phenomenon) by several reasons... *or not?*

- Concretely, a conversation shared by N people can, if a new individual enters, abruptly split in two - *for sure a nonlinear phenomenon: threshold phenomenon?*

- A group formed by N people and confined in space can cluster in several small conversations. *But while the clusters remain more or less stable, people change from conversation to conversation...*

(1) G. Simmel. The number of members as determining the sociological form of the group. **Americal Journal of Sociology,** 8:1–46, 1902.
(2) H. Sacks, E. A. Schegloff, and V. Jefferson. A simplest systematic for the organization of turn-taking for conversation. **Language**, 50:696–735, 1974.
(3) M. Egbert. Schisming: the transformation from a single conversation to multiple conversations. **Research in Language and Social Interactions**, 1:1–51, 1997.
(4) R. Parker. Conversational grouping and fragmentation: a preliminary investigation. **Semiotica**, 50:43–68, 1984.

THEORETICAL STUDIES AND EXPERIMENTS: VERY CONTEXT-SENSITIVE

Questions

1. Are the former observations accidental? Or, on the contrary, is there any ***general*** underlying mechanism for conversation dynamics?

2. Is there any general mechanism driving the **SIZE** of conversation groups?

3. Is the nucleation/schisming phenomenon **independent of the details** of each conversational event? (independent of the subject and the people involved)

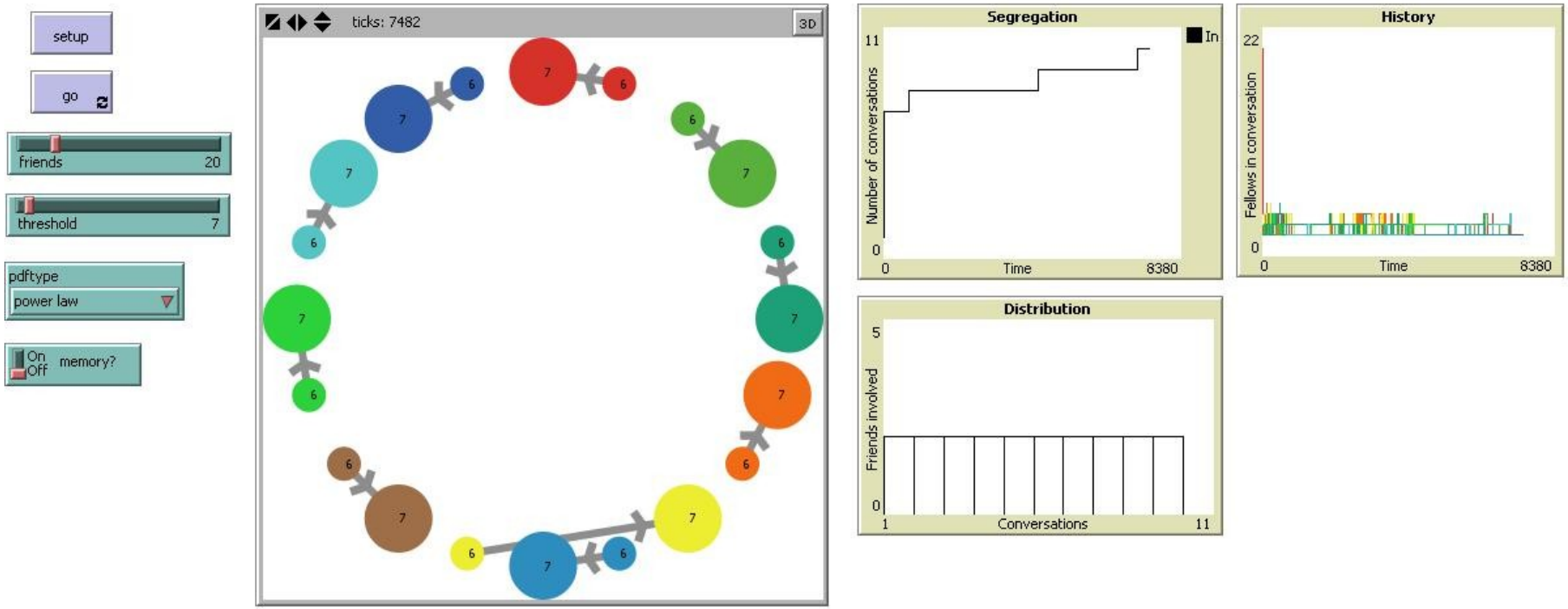
ALL THESE QUESTIONS CAN BE ADDRESSED THROUGH AGENT-BASED MODELLING.

Agent-based model: the roundtable

+ **Agents** are speakers whose willingness to participate in a conversation is encoded in a **fitness parameter** (happiness status, patience, threshold, fitness, etc) whose value is modified according to local rules. This fitness will eventually provoke that an agent leave the conversation.

+ **Turn-taking** dynamics (in each time step only one agent speaks, the others listen)

→ We can measure global behavior (**size** of stable groups, **characteristic** times). Indeed we can do lots of things... but let's remain simple: baseline model.



Specific rules of the baseline model

0. Agents are arranged around an ideal roundtable.

1. Each agent has a **fitness parameter** (same for all agents) which initially has the maximal value.

2. In each time step the speaker chooses **randomly** among all the agents, and he speaks to one of them. That agent is then entitled to speak, and accordingly its fitness will increase to its maximum (reset rule).

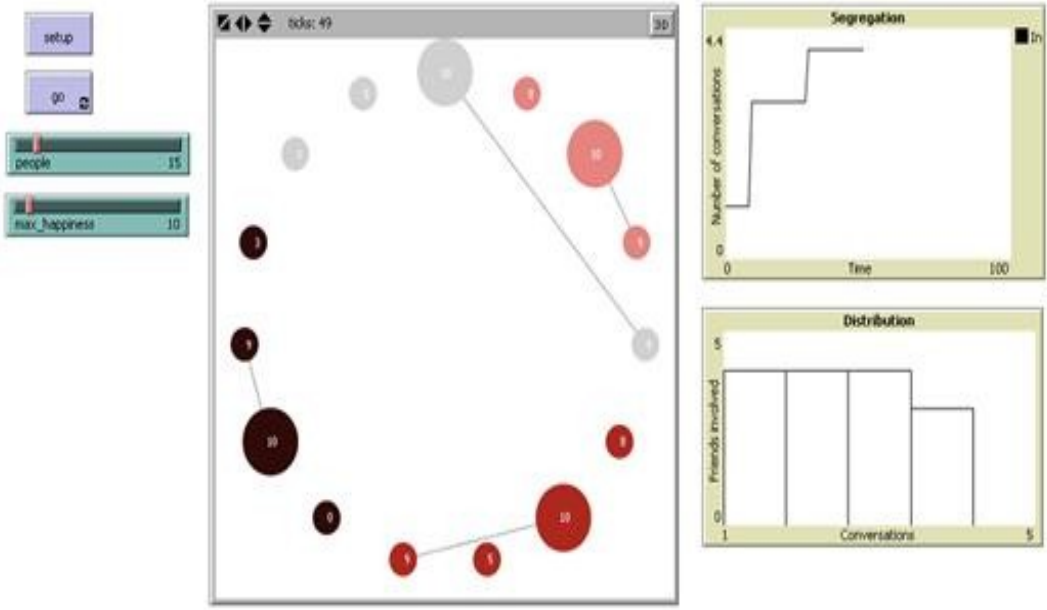
3. People not entitled to speak in a time step decrease their fitness by 1 (they get bored).

4. People whose fitness drops to zero become '**latent**'. Latent people can join a different conversation provided and if two latent agents are neighbors they can create a new conversation. (**nucleation/schisming**)

5. Since the model is purely stochastic, the stable phase is formed by N/2 groups of two persons (unrealistic: real conversations are shorter than infinite)

→ Check **transient state** (real conversations belong to the transient): time window

...



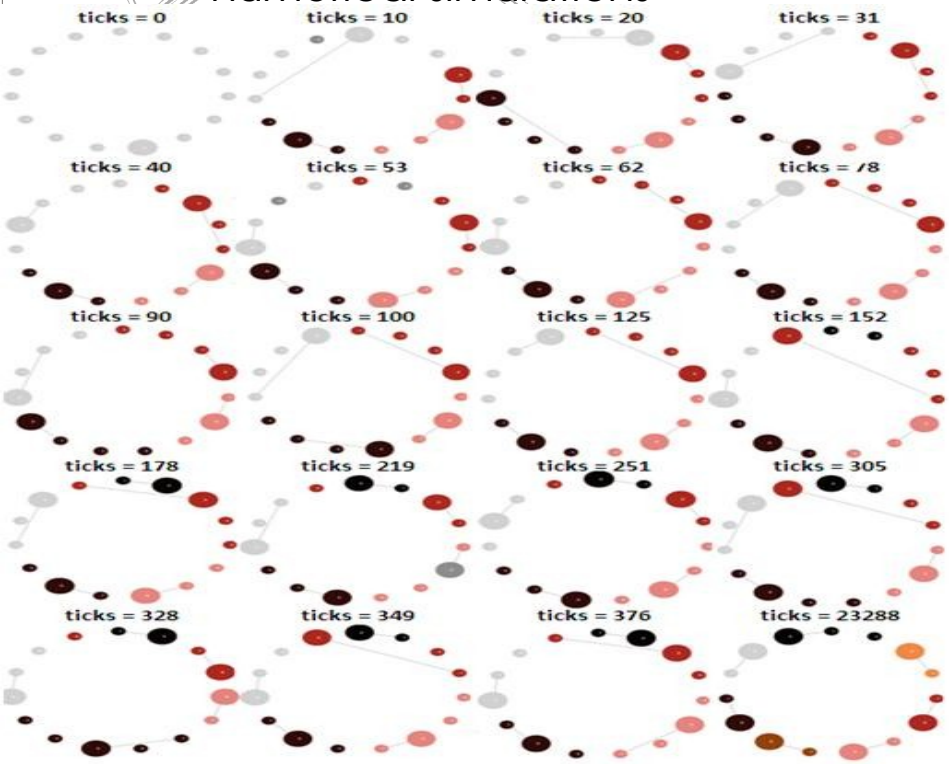
Some results

1. Transient dynamics fairly reproduce typical conversation **group sizes** (agreement with 'empirical' evidence)

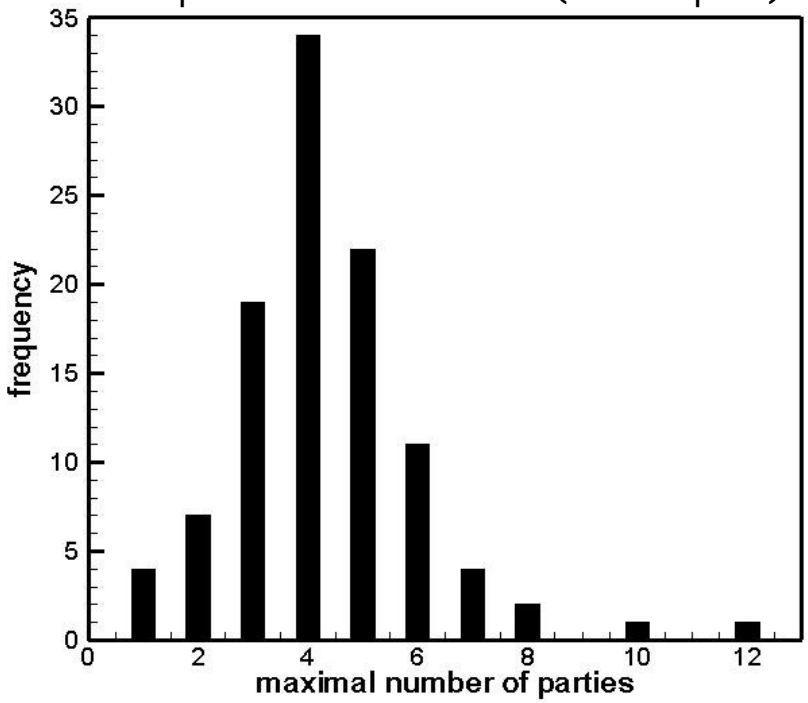
2. This holds independently of the details (absence of memory traits, preferences, etc)

3. People **join and leave** different sub-conversations, but these sub-conversations are more or less **stable** in the characteristic time

numerical simulations



"empirical" evidence (email poll)



Conclusions and Further work

1. Schism is a **purely stochastic phenomenon**, a byproduct of the local rules + stochastic turn-taking in finite time: no needs for additional info to capture the dynamics

2. An **ABM approach** to study conversation dynamics turns to be a **promising tool** since the initial results are robust (independent of the details).

Sociologists hate to model something without tones of parameters, so in future work we (or someone) should take into account:

1. ***Heterogeneity:***
- spatial (more complicated topologies, dynamically changing environments,...)
- agents (individual traits and preferences)

2. ***Memory:*** Correlated probability density (speaker-dependent, time-dependent, ...)

3. ***Experimental evidence***: cocktail parties

More in

Mastrangeli, Schmidt and Lacasa
The roundtable: an abstract model of conversation dynamics
Journal of Artificial Societies and Social Simulation (in press, 2010)

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