

# Arguments in Social Networks

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## Background

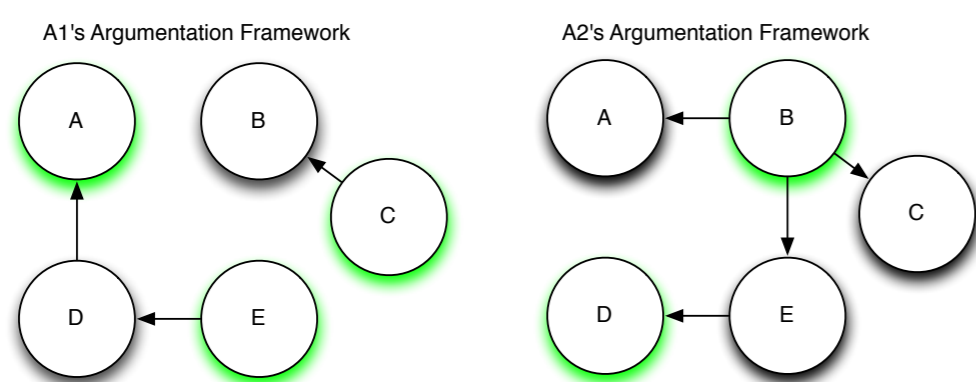
Reasoning contributes to the effectiveness and reliability of communication by allowing communicators to argue for their claim and by allowing addressees to assess these arguments.

In social sciences there is a plea for the use of logic-related approaches in ABSS, but we are not aware of any previous ABSS model that uses argumentation [6].

On the contrary, in multi-agent research, argumentation-based interaction has been thoroughly investigated, also in the context of dialog and in relation with trust.

## Abstract Argumentation

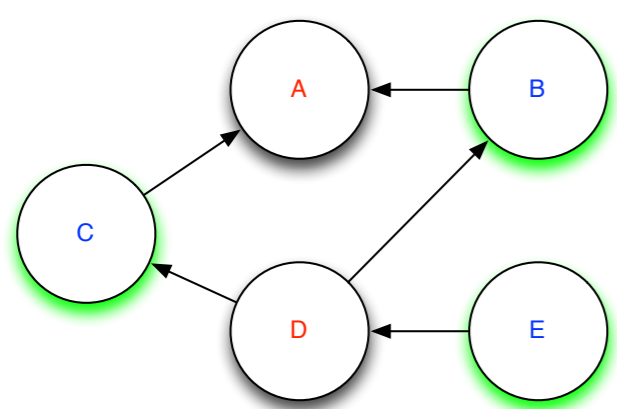
In computational abstract argumentation, as defined by Dung [1], an "Argumentation Framework" (AF) is defined as a pair  $(A, R)$ , where  $A$  is a set of atomic arguments and  $R$  is a binary attacks relation over arguments,  $R \subseteq A \times A$ , with  $\alpha \rightarrow \beta \in R$  interpreted as "argument  $\alpha$  attacks argument  $\beta$ ." Sets of "justified" arguments can be described by various extension-based semantics. In particular, an extension-based semantics identifies a number of subsets of  $A$  that all together represent a coherent set of beliefs.



Argumentation frameworks can be generated at random but they can also be extracted from natural language, i.e. from online text corpora like discussion forums.

<http://www.topix.com/forum/news/2012-presidential-election/TC6SGHF806TJRRBUB>

A: OBAMA WAS BORN IN MOMBASA, KENYA! YOU NEED AN EDITOR! WAKE UP  
 B->A: Barack Obama was born at the Kapi'olani Medical Center for Women & Children in Honolulu, Hawaii, to Ann Dunham, a White American from Wichita, Kansas of English and Irish descent.  
 C -> A: Incorrect as usual. [LINK] When will you paranoid loons put this to rest.  
 D: No one has produced an original birth certificate. If President Barack Hussein Obama has one, he should let the rest of the world see it.  
 E->D: Factcheck.org, Politifact.com, The LA Times, World Nut Daily have all examined his birth certificate and told everyone.



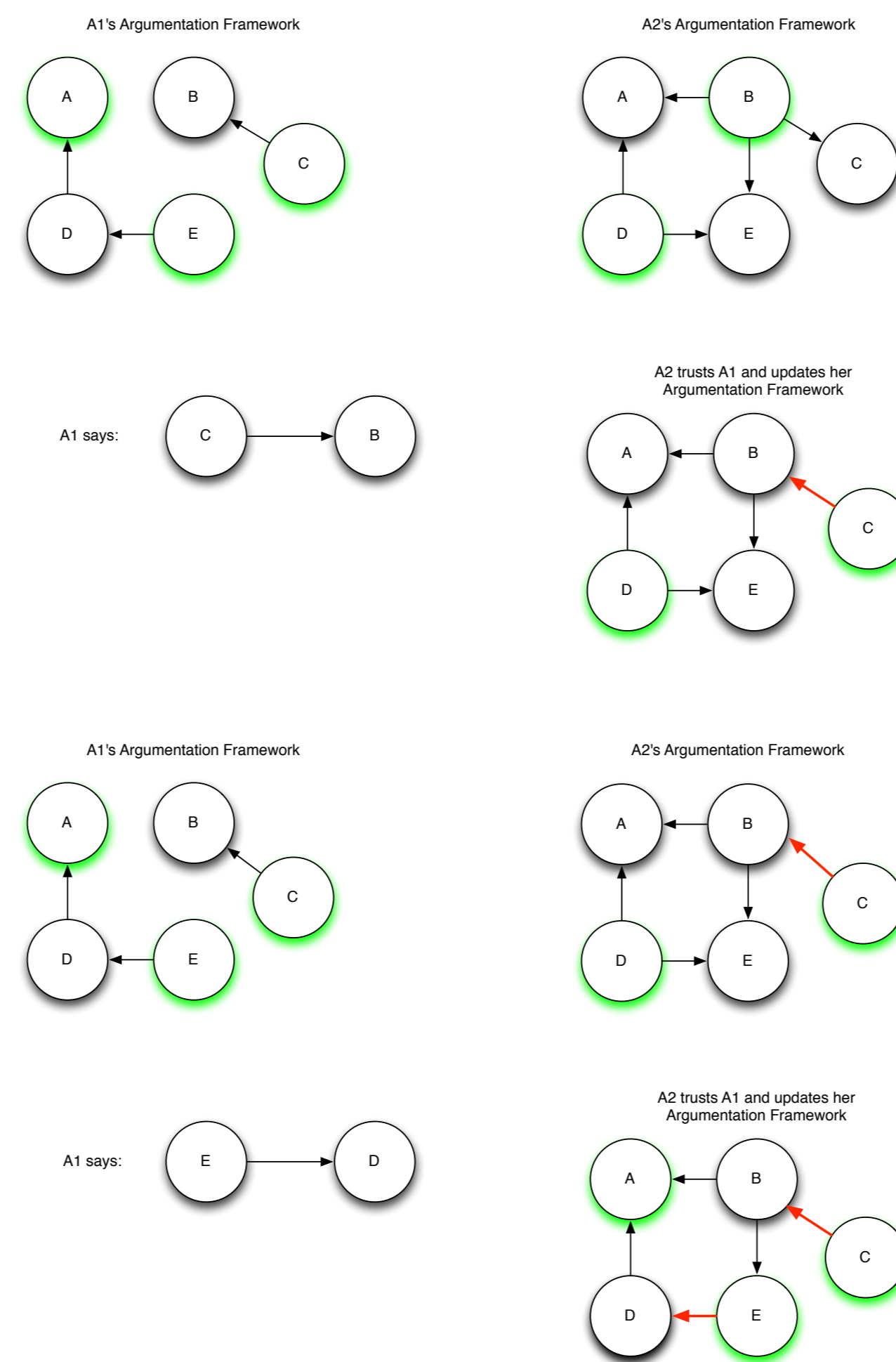
## You can then simulate a dialogue...

We propose an agent-based model for simulating interaction between social agents by means of abstract arguments exchanged in simulated dialogues [2]. Agents reason argumentatively, and implement epistemic vigilance by way of trust calibration and coherence setting within a dialogue [3].

This simple conceptual framework allow us to introduce argumentation as the key reasoning capability of our artificial agents. We identify abstract argumentation, as the conceptual and computational framework to model arguments and reason from them automatically.

We propose an agent-based model where agents reason and interact argumentatively. During an exchange with a peer, an agent is constantly assessing whether (a) the new information is coherent with her beliefs; (b) new arguments suffice to accept the new piece of information; (c) in case of new incoherent information that requires revising beliefs, whether the counterpart is to be trusted or not.

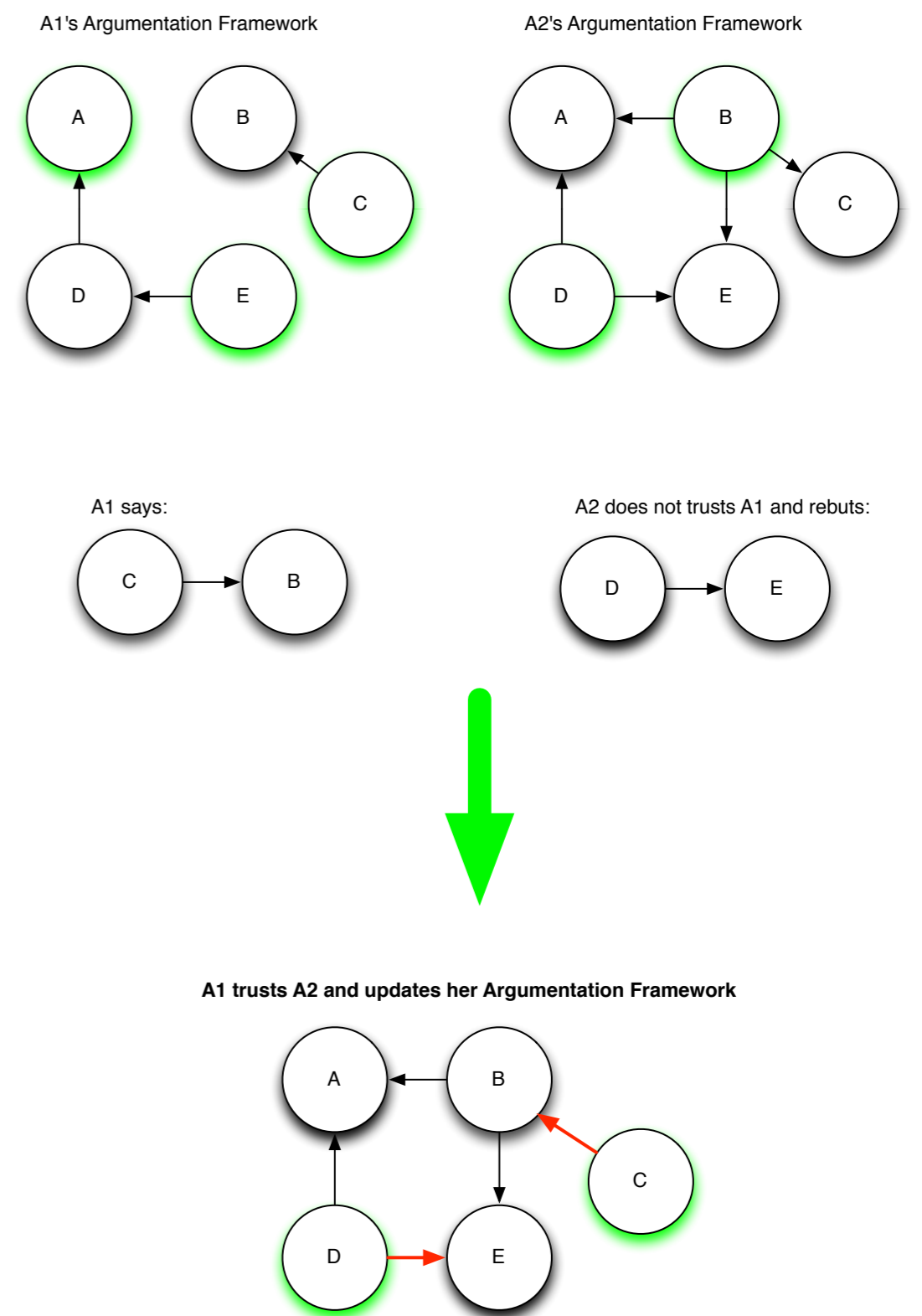
In our simulated environment, the argumentative reasoning processes underlying every exchange are automated.



## ...with rebuttals

We build on well-established theories from social, cognitive, and computer science:

- Granovetter's concept of social embeddedness [4];
- Mercier & Sperber's argumentative theory of reasoning [5];
- Dung's abstract argumentation computational framework.



According to Mercier & Sperber, the function of reasoning is argumentative. Reasoning enables people to exchange arguments that, on the whole, make communication more reliable and hence more advantageous.

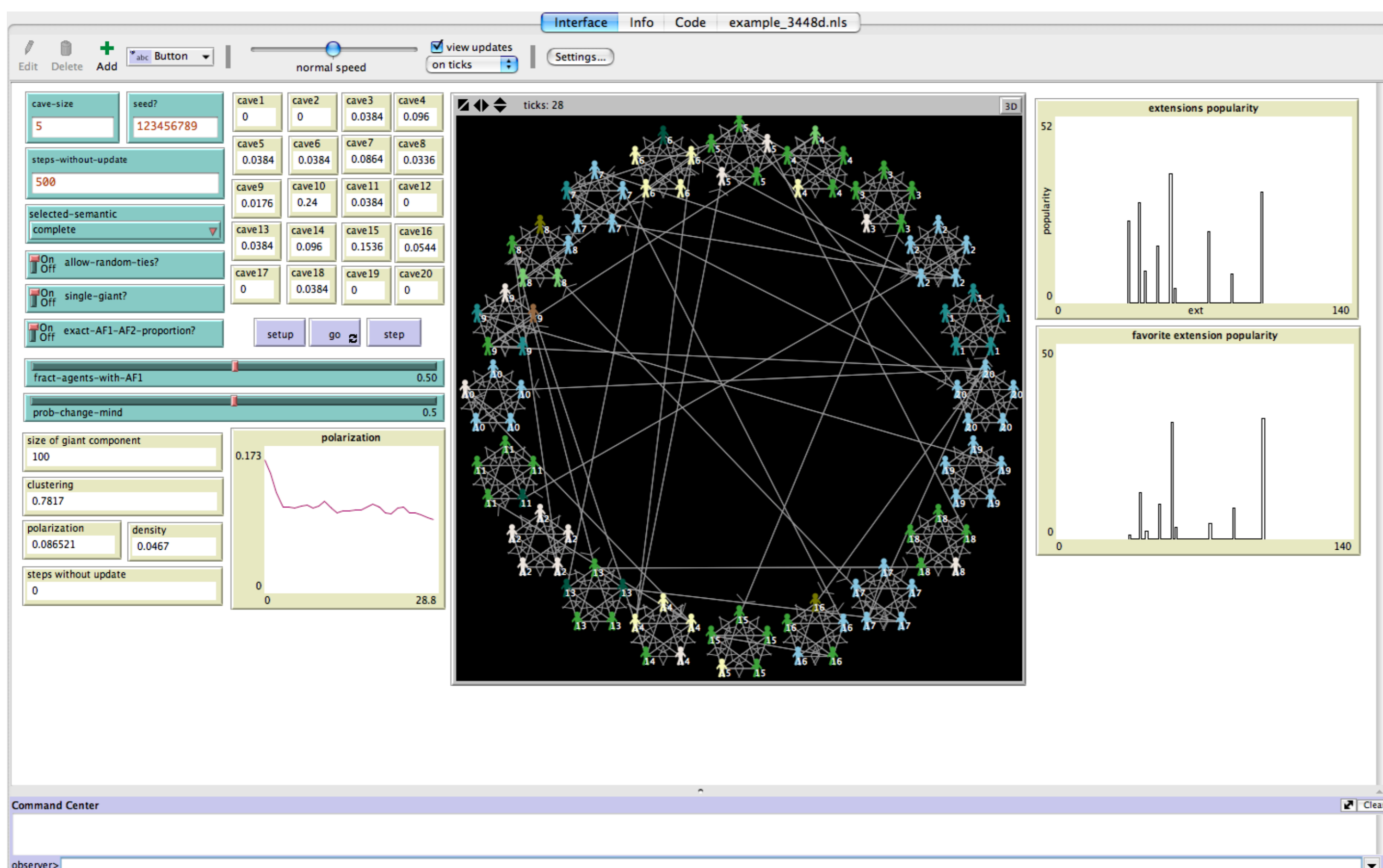
Several psychological mechanisms may contribute to epistemic vigilance. The two most important of these mechanisms are trust calibration and coherence setting.

Some initial coherence checking occurs in the process of comprehension. When it uncovers some incoherence, an addressee must choose between two alternatives: either to reject communicated information, thus avoiding the risk of being misled, or to update earlier beliefs and allow for a finer-grained process of beliefs revision. In particular, if a highly trusted individual tells us something that is incoherent with our previous beliefs, some revision is unavoidable.

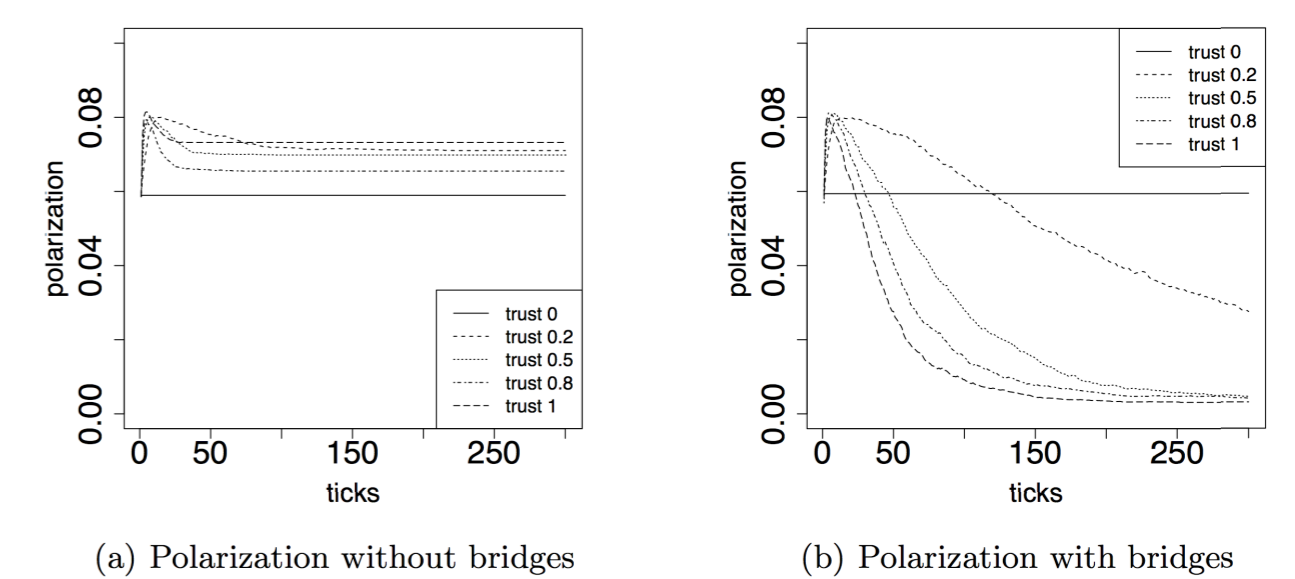
On the other hand, if a communicator wants to communicate a piece of information that the addressee is unlikely to accept on trust, she can produce arguments for her claims, and encourage the addressee to examine, evaluate, and accept these arguments

The result is an ABSS model which simulates a population of social agents that interact within a social structure, exchange information by means of simulated discussions and possibly reach an agreement.

## We implemented our model with NetLogo



## Conclusions



We implemented the model and ran some initial experiments. Our results confirm that our logic approach can be profitably used in ABSS in order to obtain meaningful results, with an artificial population of argumentative agents.

Among other results, we found that our hypotheses on the dialogue procedure are, in principle, sufficient to reproduce two macro-behaviors embedded in Granovetter's theory, i.e., the tendency of inclusion of weak ties and a competitive advantage for non-isolated caves.

## References

- [1] P. M. Dung. On the acceptability of arguments and its fundamental role in nonmonotonic reasoning, logic programming and n-person games. *Artif. Intell.*, 77(2):321 – 357, 1995.
- [2] S. Gabriellini and P. Torrioni. NetArg: An agent-based social simulator with argumentative agents (Demonstration). In *Proc. 12th AAMAS*, 2013.
- [3] S. Gabriellini and P. Torrioni. MS Dialogues: Persuading and getting persuaded. A model of social network debates that reconciles arguments and trust. In *Proc. 10th ArgMAS*, 2013.
- [4] M. Granovetter. The strength of weak ties: a network theory revisited. *Sociological Theory*, 1:201–233, 1983.
- [5] H. Mercier and D. Sperber. Why do humans reason? Arguments for an argumentative theory. *Behavioral and Brain Sciences*, 34(02):57–74, 2011.
- [6] W. Reich. Reasoning about other agents: a plea for logic-based methods. *JASSS*, 7(4), 2004.