Modeling Small Group Interaction on Pervasive Digital Channels

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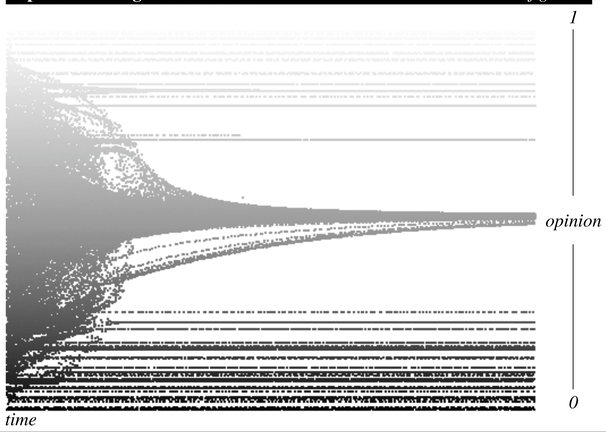
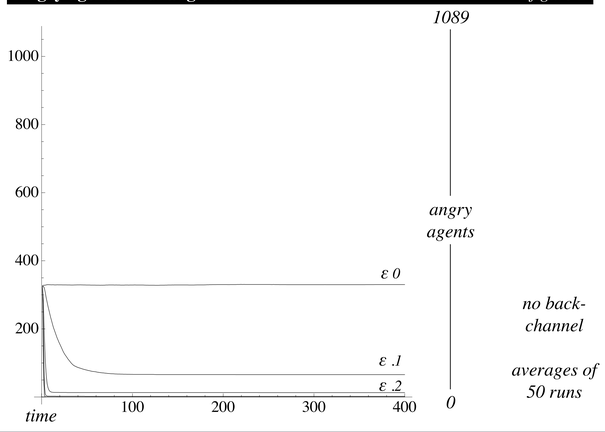
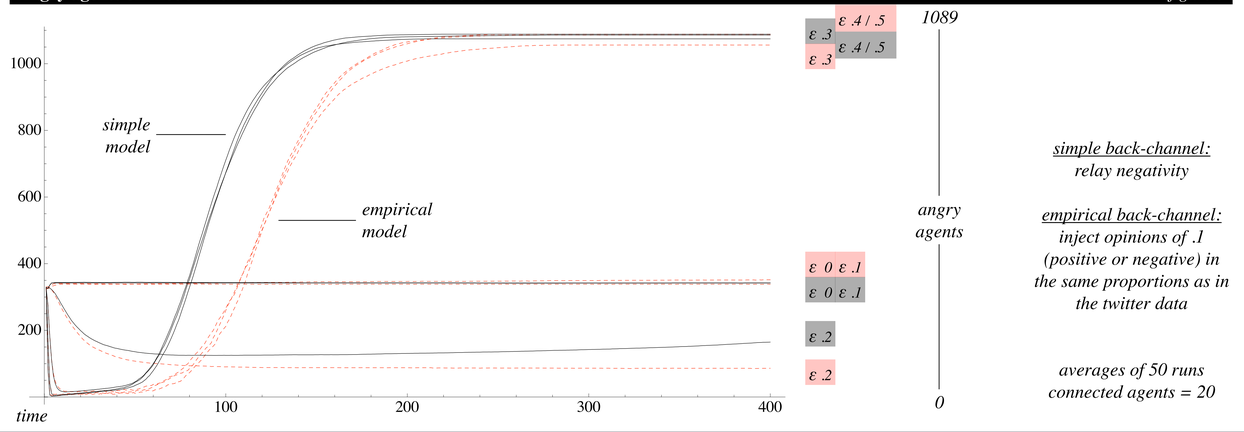
Opinions during one model run *figure 1*



Angry agents on unaugmented model *figure 2*



Angry agents on model with backchannel mode one and two *figure 3*



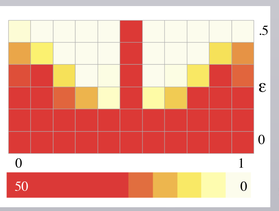
Challenge

Opinions about social events are increasingly shared on digital backchannels. This development poses a new challenge to the modeling of opinion dynamics: Additional Modes of communication lead to more volatile opinion dynamics. At the same time, data generated in these backchannels can be used as a possible validation for models.

Opinion Dynamics

This opinion dynamics model uses a two-dimensional Cellular Automaton to represent an audience that remains stationary. In the setup, procedure each agent is randomly assigned an opinion value between zero and one. Following discrete timesteps, agents use an universal transition rule to compute their opinion from the average of their immediate neighbors. A sample run with narrow bounded confidence is shown in *fig. 1*.

figure 4



Survivors

Horizontal: Number of opinions (0; 0.1; … 1) that prevail after 500 ticks among 50 runs of the model

Vertical: bounded confidence (ε) in steps of .1 from 0

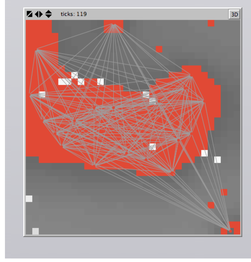
Basic Model

Comparing the number of opinions that survive after multiple runs *(fig. 4)* with the results of existing models of opinion dynamics (Weisbuch et al.: 2001; Hegselmann and Krause: 2002), we find that our implementation of the basic model produces comparable results to established models in the field.

Virtual Conversations

In a next step we implemented a simple backchannel in our opinion dynamics model. We randomly selected 20 agents and established direct links between those agents. In addition to their eight neighbors, these agents now have up to 10 peers they are connected to. Taking into account the negative bias in online-communication (Alonzo and Aiken: 2002), stronger negative opinions are disseminated through the backchannel.

figure 5



Backchannel

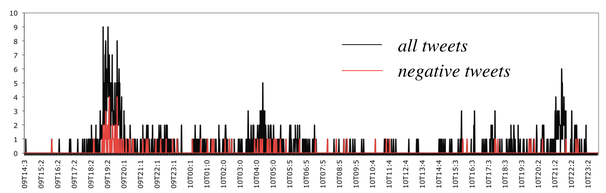
A backchannel is a way for users to communicate in addition to face-to-face communication. This leads to a different perception of social events by spectators who communicate through one or more different backchannels and spectators who are not part of that conversation. Popular ways to establish backchannels are SMS, IRC or online services like Twitter.

Prior to the introduction of connected peers, the model behaves very stable. If we designate opinions below .3 as negative, the most exteme state is reached at 30% total negativity. *Fig. 2* reveals that this happens when bounded confidence is zero, and thus all agents keep their opinions.

Tipping Point

Our first implementation of the backchannel adds a second transition rule to the system. Connected agents now evaluate their linked peers as well, and accept a slightly biased average of those distant opinions. This augmentation introduces a tipping point around ε = 0.2, above which the model quickly tips over and all agents become negative (*fig. 3*).

Tweets / Time *figure 7*

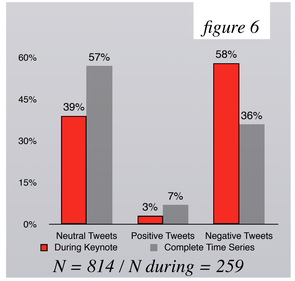


Keynote Twittering

The "Zuckerberg / Lacy Keynote" is an event similar to our model so we can use data from this incident as a fit to the data generated by our model. We recorded all messages related to the event which originated in the network of Twitter evangelist Robert Scoble.

The time series of Tweets (*fig. 7*) shows that there was a spike in negativity during the keynote. But this amount of negativity does not continue in the aftermath of the keynote address. A second address later the next day was instead met with largely positive reactions by the same group of Twitterers who trashed his first speech only hours before. Thus backchanneling does not necessarily lead to negativity. It also seems that the audience's negative reaction to the keynote was more of a gut-reflex, than a reflected opinion towards the event.

figure 6



N = 814 / N during = 259

This decrease in exteme negativity in Tweets corresponds with findings in studies on public discourse in the web (Wu and Huberman: 2008).

Empirical Influx

Following the relatively simple model of a second network that relays negativity over added connections, a second variant of the backchannel was equipped with a different source of opinions. In this case, a random generator produces negative, neutral and positive messages in accordance to the proportions found in the data we gathered from twitter.

twitter

Twitter is an online service which enables its users to publish short text messages, each one up to 140 characters in length, over the internet or through SMS. These messages are called Tweets. They are collected in a private or public feed which can be syndicated by any number of users who then are informed of new messages on a user's feed via the internet or SMS.

Results

While evolving somewhat slower than the first variant, the second type of backchannel essentially displays the same dynamics. The decisive factor thus lies in the added channel itself.

These results are interesting in that they show, that even with the limited complexity of Opinion Dynamics research, and

— utilizing bounded confidence as the only variable,
— models can be built to closely match real situations,
— by combining different types of agent networks (such as cellular automata, scale-free networks etc).

Zuckerberg / Lacy Keynote

In early 2008 Facebook founder Mark Zuckerberg and journalist Sarah Lacy held a moderated keynote presentation for the SXSW conference in Texas. During the talk parts of the audience used Twitter to share their spontaneous reactions to the event. Very soon negative comments dominated the conversation on the backchannel. This led to disruptions and proved to be extremely disruptive to the event.

Alonzo, M. and Aiken, M. (2002): "Flaming in electronic communication". Decision Support Systems. Vol. 35, No. 3. pg. 205-213.
Hegselmann, R. and Krause, U. (2002): "Opinion Dynamics and Bounded Confidence Models, Analysis, and Simulation". Journal of Artificial Societies and Social Simulation. Vol. 5., No. 3. <http://jasss.soc.surrey.ac.uk/5/3/2.html >.
Weisbuch G.; Deffuant G.; Amblard F. and Nadal, J. P. (2001): "Interacting agents and continuous opinion dynamics". <http://arXiv.org/pdf/cond-mat/0111494>.
Wu, F. and Huberman, B. A. (2008): "Public Discourse in the Web Does Not Exhibit Group Polarization". <http://arxiv.org/abs/0805.3537>.