

Opinion dynamics about oneself and others

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*Derived from Deffuant, Carletti and Huet, JASSS 16 (1) 5,
2013*

opinions (attitudes) about others and oneself

- We consider an attitude that an agent A has about agent B
- If this attitude is positive then agent A likes agent B, if negative agent A dislikes agent B



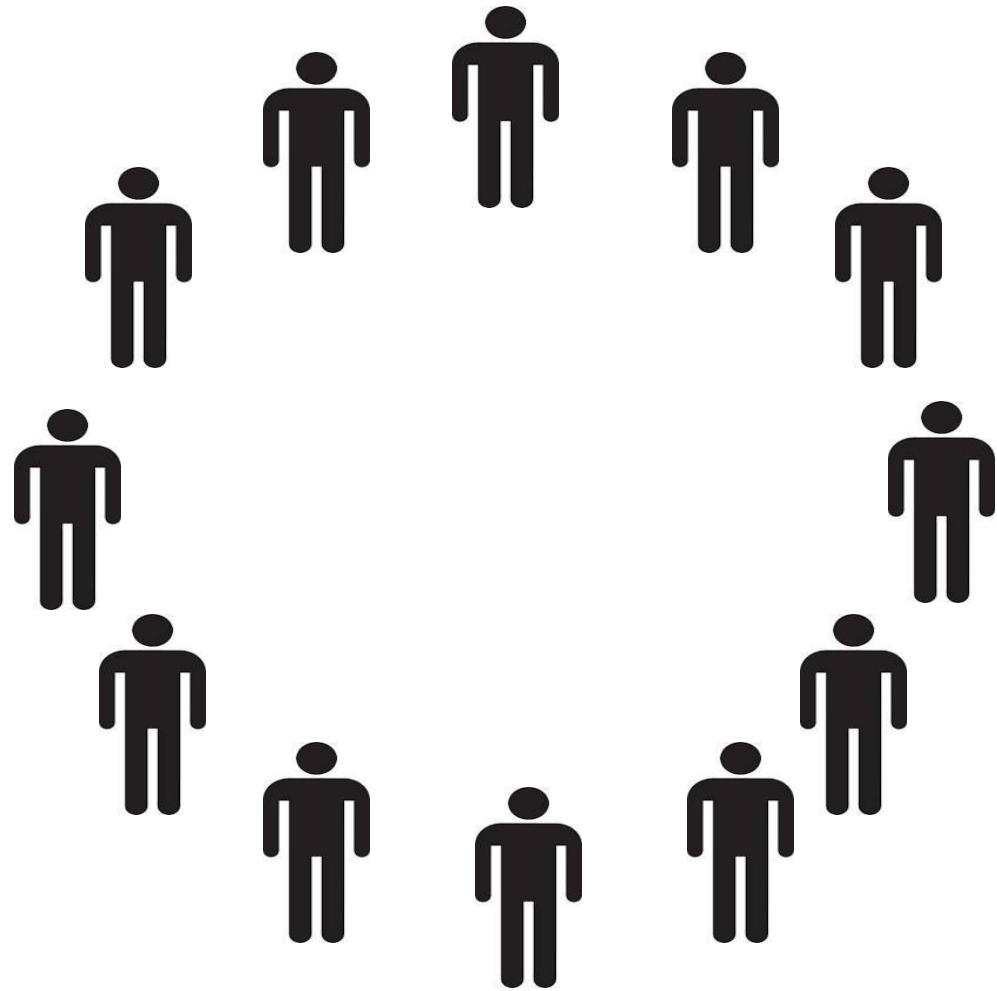
How do opinions (attitudes) about others (and oneself) change ?

- Intrinsic qualities (beauty, intelligence...)
- Randomness of interactions

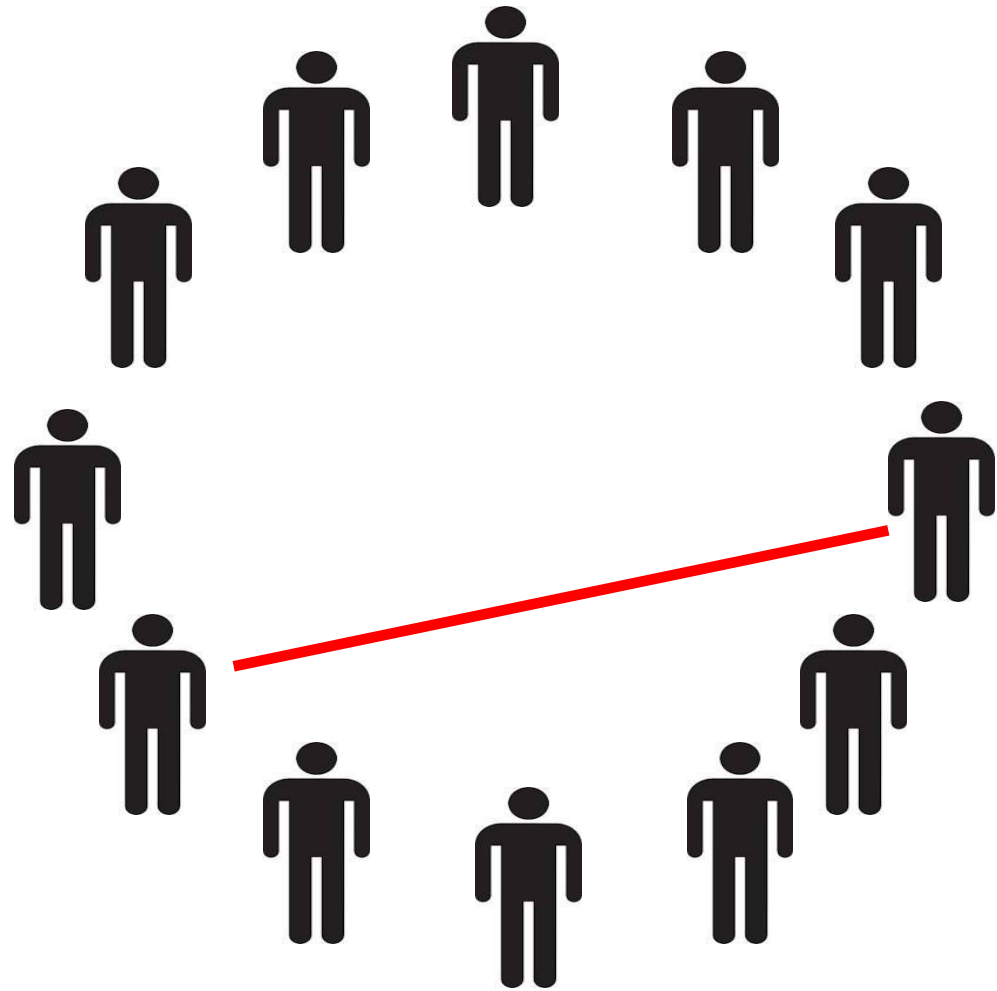


Neutral Hypothesis

- ~~• Intrinsic qualities
(beauty, intelligence)~~
- All agents initially identical, neutral opinion (0) for all the others and oneself
- Opinions evolve through interactions with some randomness
- Inspired from neutral theory of biodiversity (S. Hubbel)

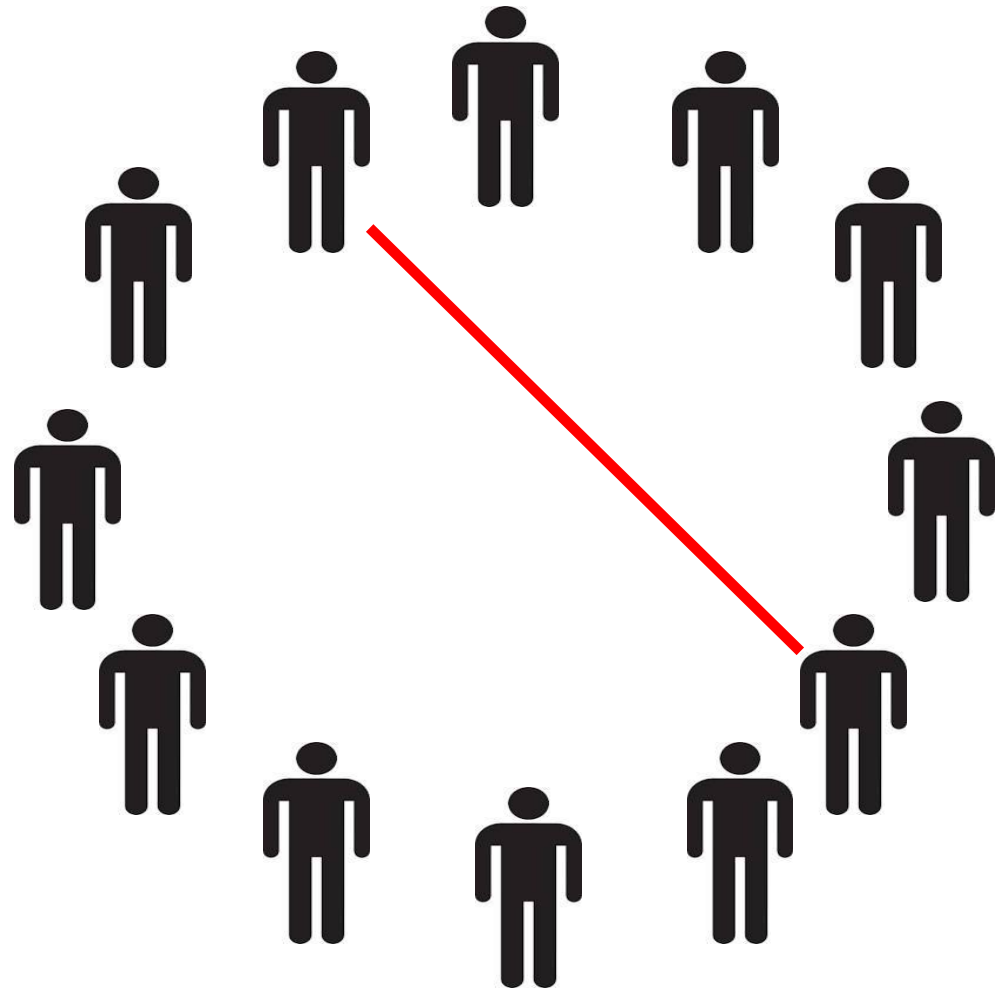


Random pair interactions

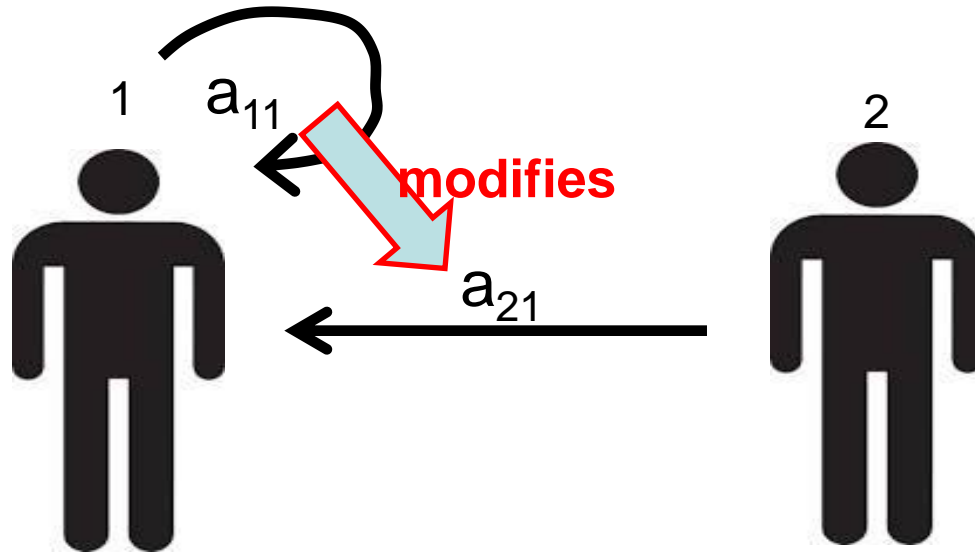


Random pair interactions

- At each interaction agents modify their opinion about the other and may modify their self opinion



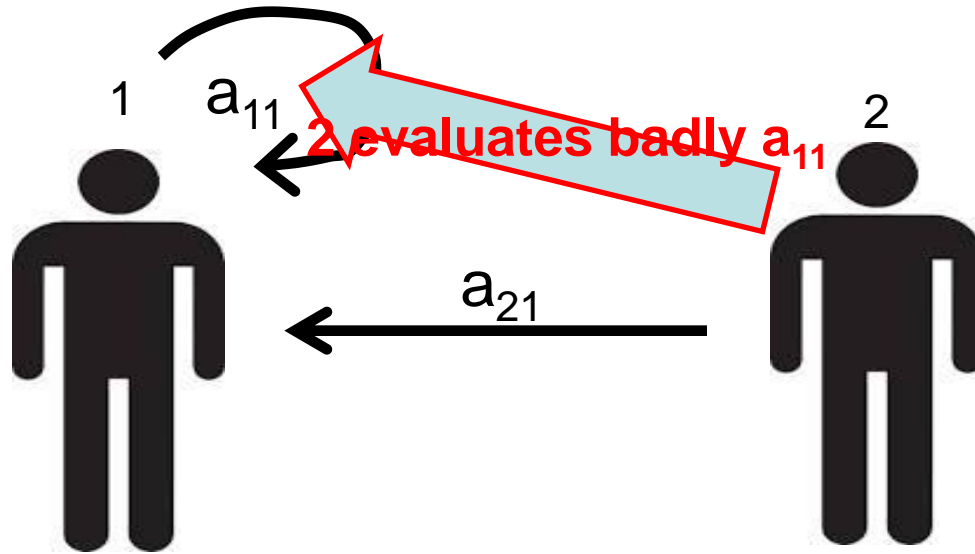
Usual opinion attraction



$$a_{21} := a_{21} + \rho(a_{11} - a_{21})$$

Agent 2 opinion about 1 gets closer to self opinion of agent 1

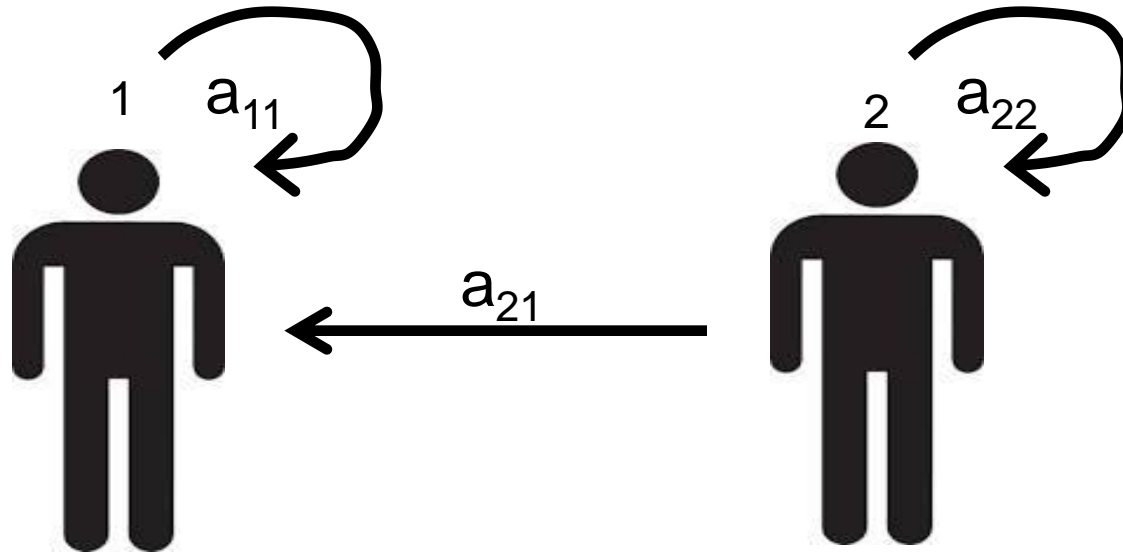
Errors in opinion evaluation



$$a_{21} := a_{21} + \rho(a_{11} + \delta_t - a_{21})$$

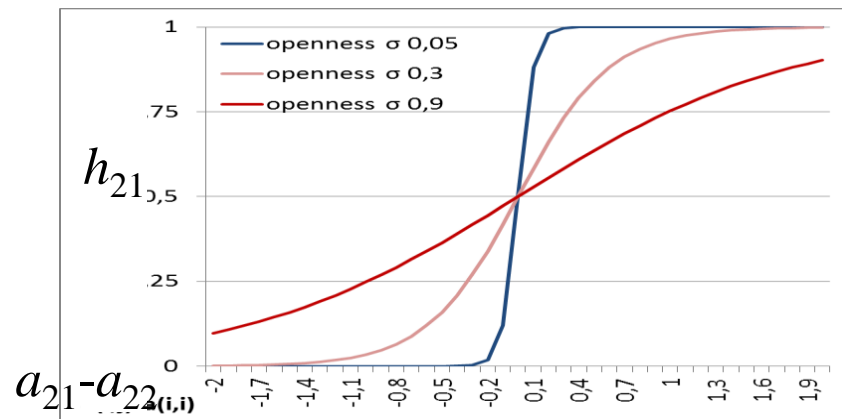
random noise
between $-\delta$ and $+\delta$

Highly valued agents are more influential

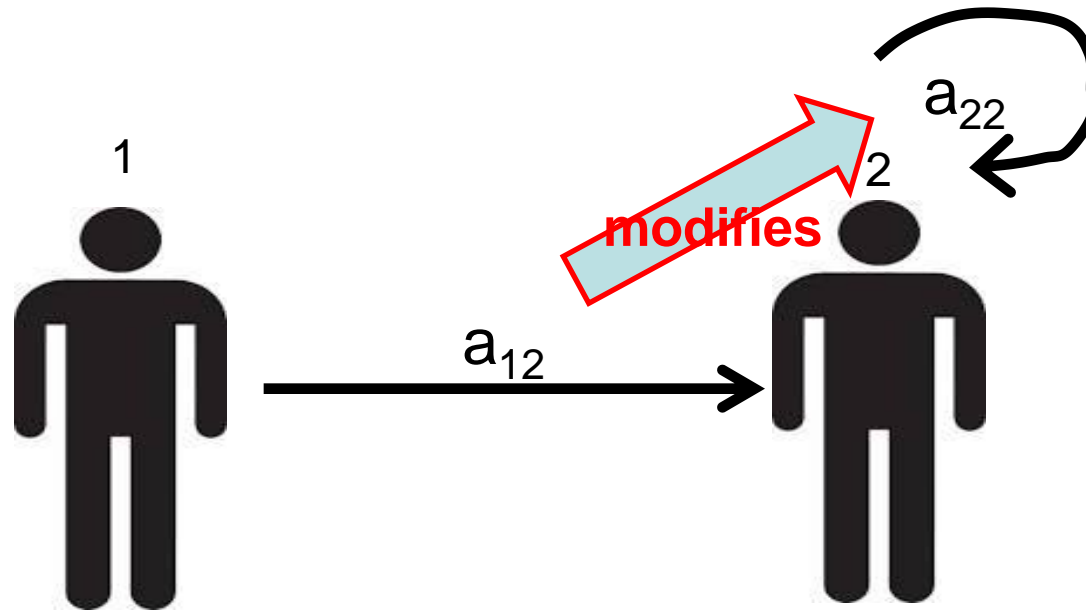


$$a_{21} := a_{21} + \rho \cdot h_{21} (a_{11} + \delta_t - a_{21})$$

$$h_{21} = \frac{1}{1 + \exp\left(-\frac{a_{21} - a_{22}}{\sigma}\right)}$$

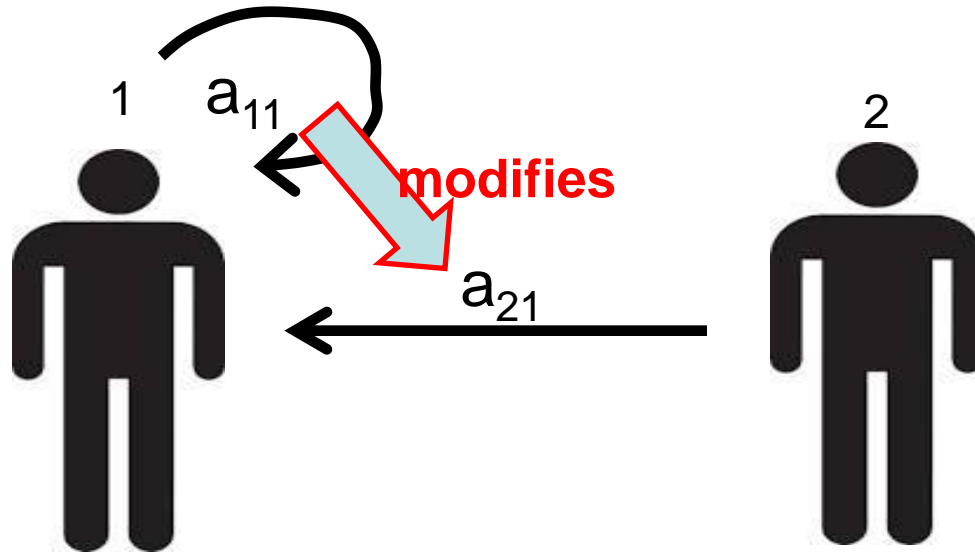


Also opinion of 1 about 2



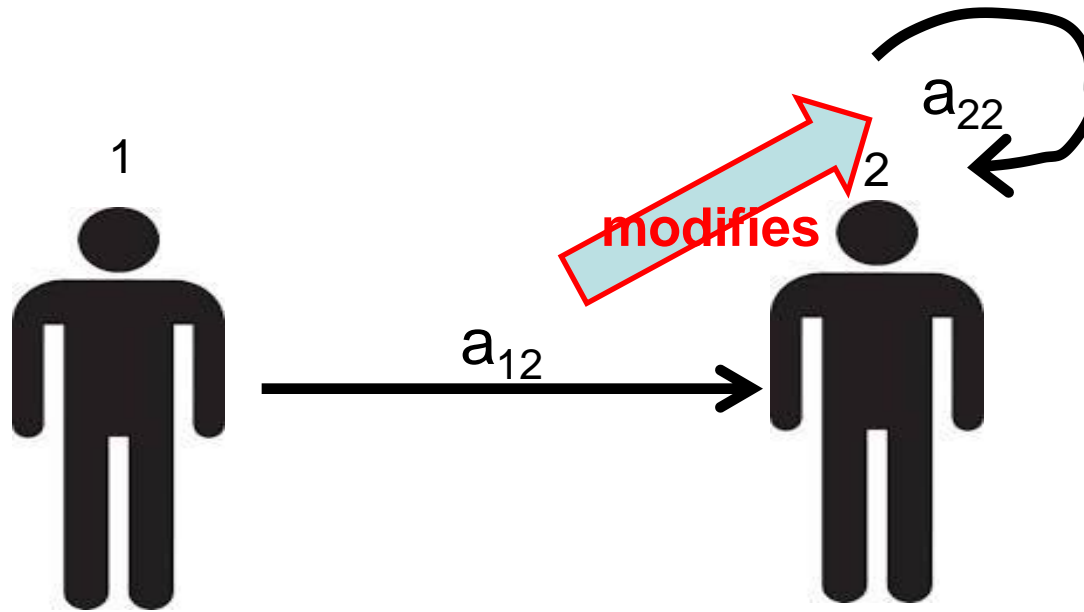
$$a_{22} := a_{22} + \rho \cdot h_{21} (a_{12} + \delta_t - a_{22})$$

Summary



$$a_{21} := a_{21} + \rho \cdot h_{21}(a_{11} + \delta_t - a_{21})$$

Summary



$$a_{22} := a_{22} + \rho \cdot h_{21} (a_{12} + \delta_t - a_{22})$$

Opinion attraction only

$N = 25$ agents

$\sigma = 0.3$

$\delta = 0.2$

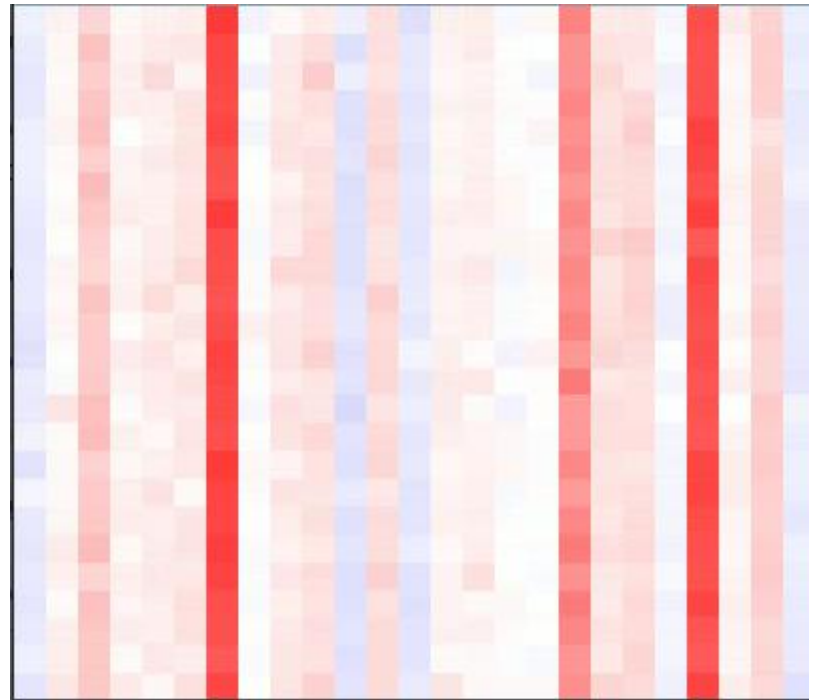
$\rho = 0.5$

$\omega = 0.0$

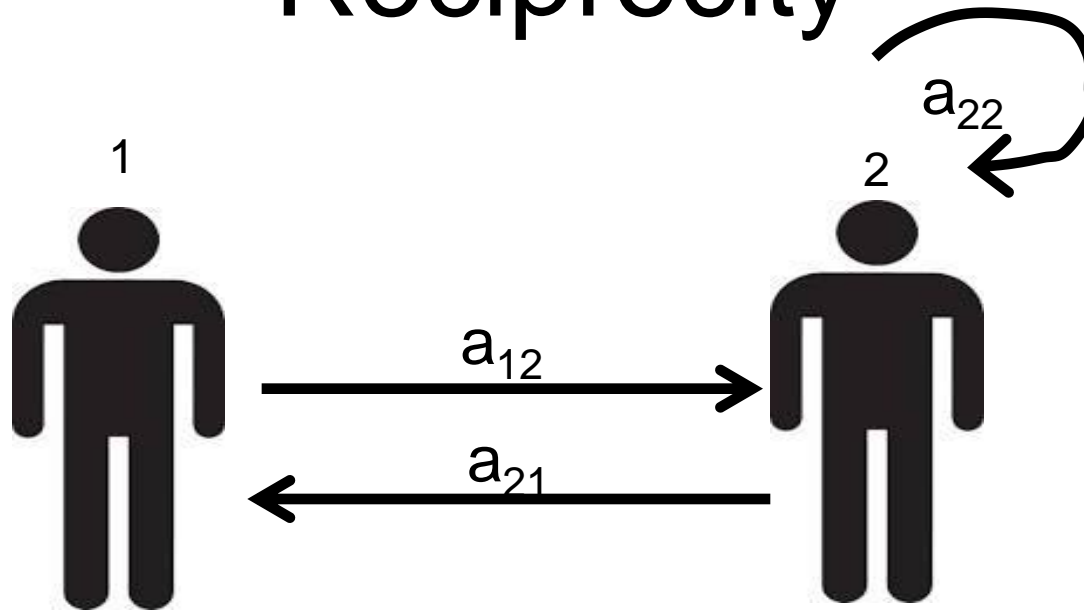


Interaction effects

- Agents tend to agree on their opinions about each agent: standard convergence effect
- Drift towards positive opinions: because when self opinion increases the agent becomes more stable



Reciprocity



If 2 thinks that $a_{12} > a_{22}$ then 2 is happy and increases a_{21}

If 2 thinks that $a_{12} < a_{22}$ then 2 is unhappy and decreases a_{21}

$$a_{21} := a_{21} + \omega(a_{12} + \delta_t - a_{22})$$

If $a_{21} < -1$ then $a_{21} := -1$, If $a_{21} > 1$ then $a_{21} := 1$

Reciprocity only

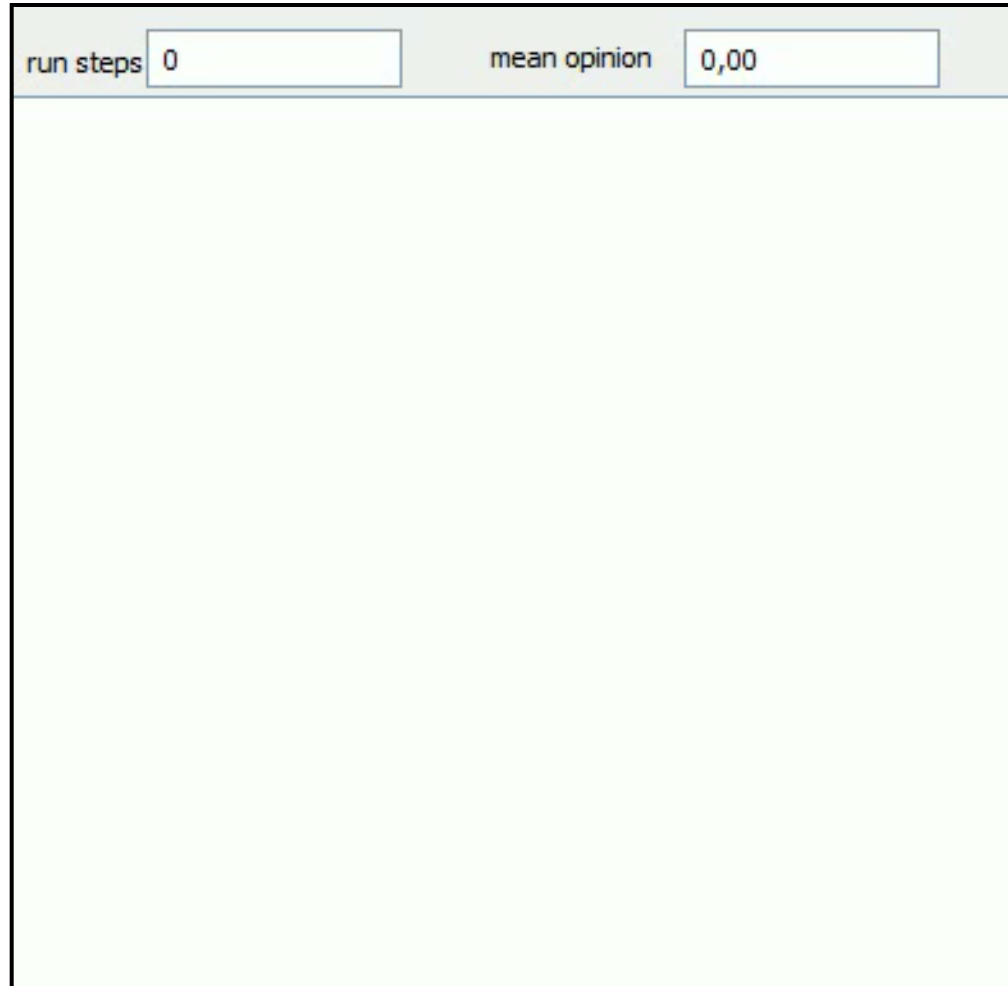
$N = 25$ agents

$\sigma = 0.3$

$\delta = 0.2$

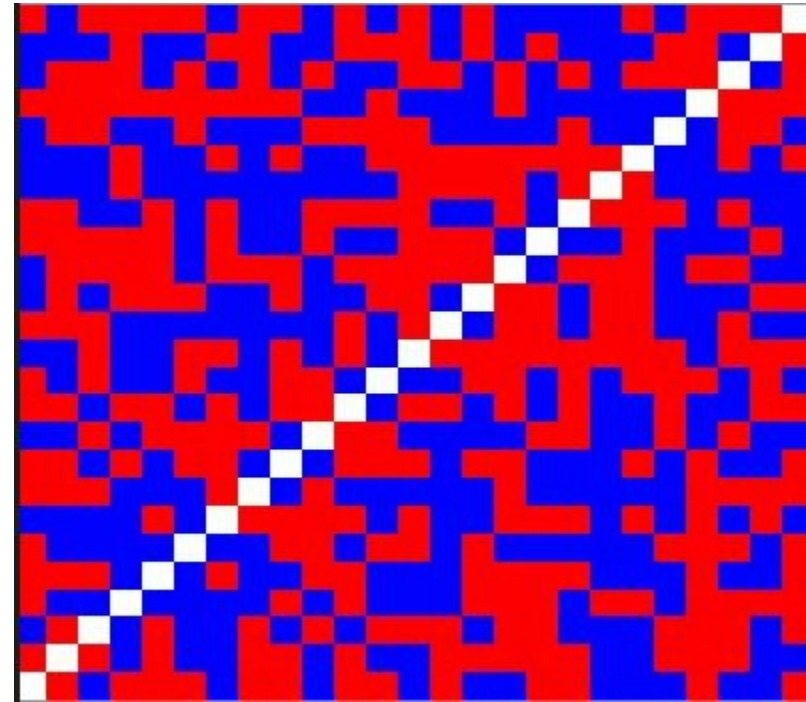
$\rho = 0.0$

$\omega = 0.2$



Reciprocity only

- Agents have extreme opinions (either -1 or +1).
- Same number of friends and enemies
- All self opinions remain 0
- The small initial random errors of opinion perception tend to be increased until +1 or -1, by retaliation loops.



Mixing reciprocity with small opinion attraction

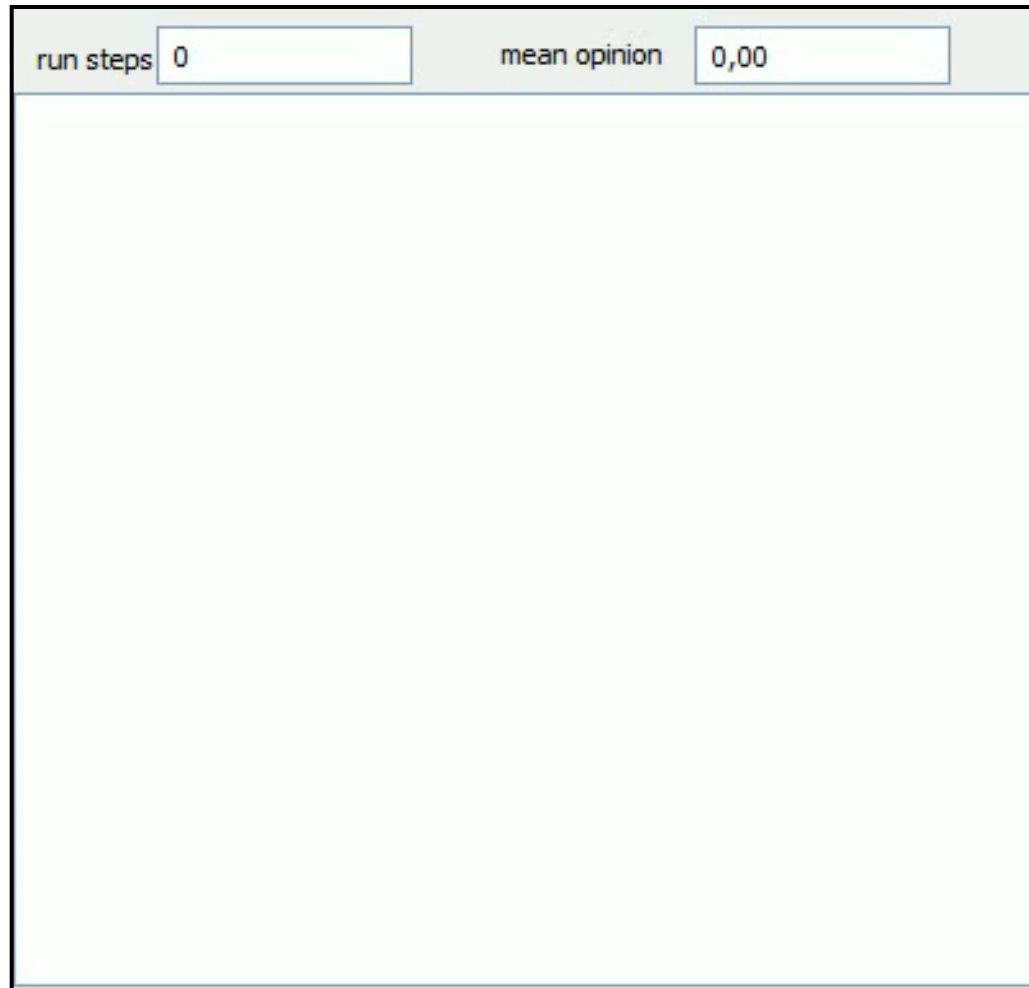
$N = 25$ agents

$\sigma = 0.3$

$\delta = 0.2$

$\rho = 0.02$

$\omega = 0.2$



Positive self-opinions

- Initially, fast dynamics on reciprocity, as before:
 N_f number of friends $\approx N_e$ number of enemies
- Slow dynamics of opinion attraction leading to equilibrium

$$a_{ii} \approx N_f w_f a_{fi} + N_e w_e a_{ei}$$
$$a_{fi} \approx 1$$
$$a_{ei} \approx -1$$
$$w_f > w_e \approx 0$$

- Friends of agent i are highly valued by i and also have a positive opinion of agent i , and enemies have a low influence. Thus $a_{ii} \approx 1$.

Why are friends lost ?

- When $a_{ij} \approx 1$ then risk that the opinion of a friend is seen lower than a_{ij} (because of the noise)
- This tends to launch a negative reciprocity loop and the friend becomes an enemy. Which decreases a_{ij} .
- Finally a_{ij} stabilises when it is small enough to guarantee that even with the noise the perceived opinion of friends is higher.

Increasing opinion attraction

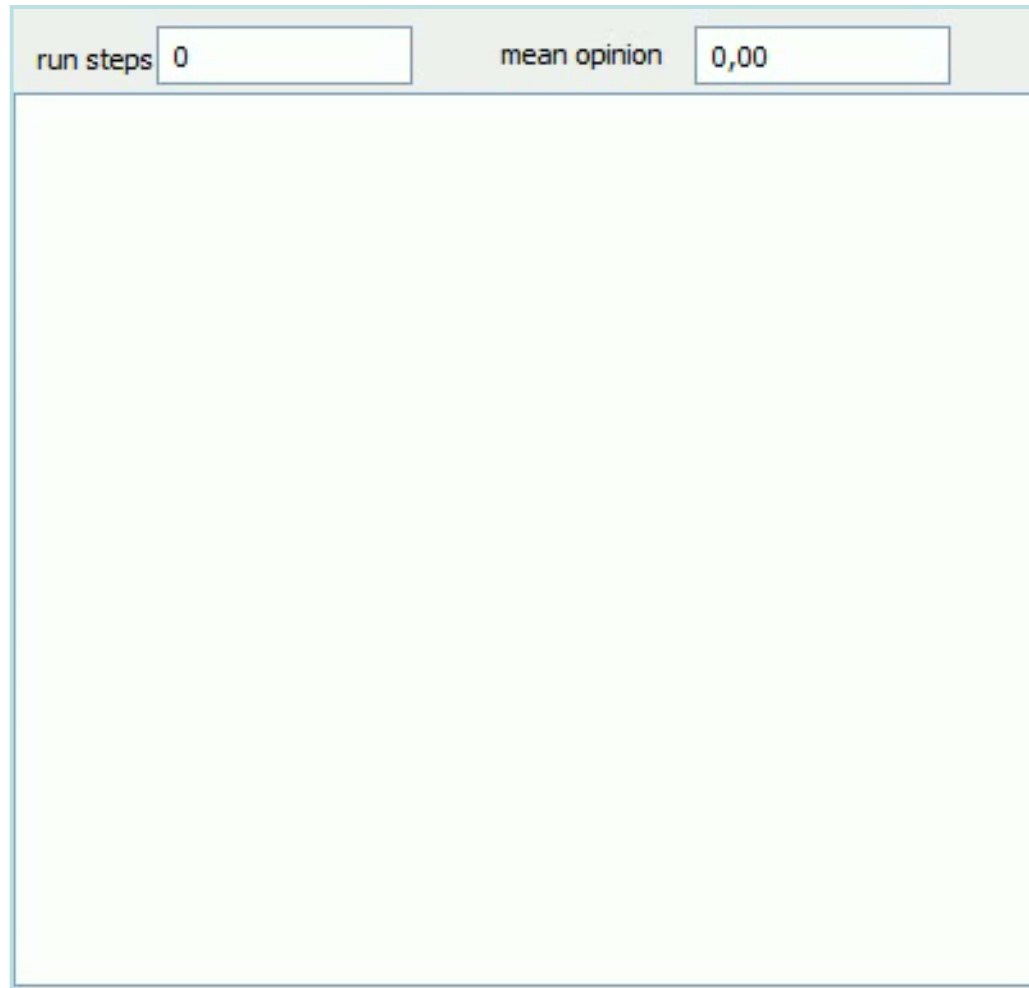
$N = 25$ agents

$\sigma = 0.3$

$\delta = 0.2$

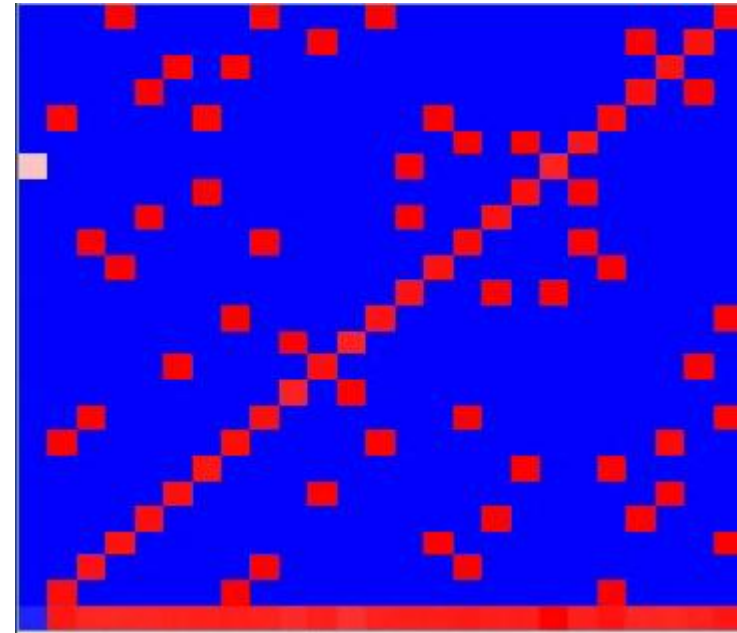
$\rho = 0.05$

$\omega = 0.05$



« Scape goat » agent

- When an agent loses all its friends, its self opinion decreases close to -1,
- It becomes more influenced by all its former enemies which have a high self-opinion and adopts this high opinion
- Scape-goats have a high opinion of everybody except themselves, and everybody has a low opinion of them.



Increasing more opinion attraction

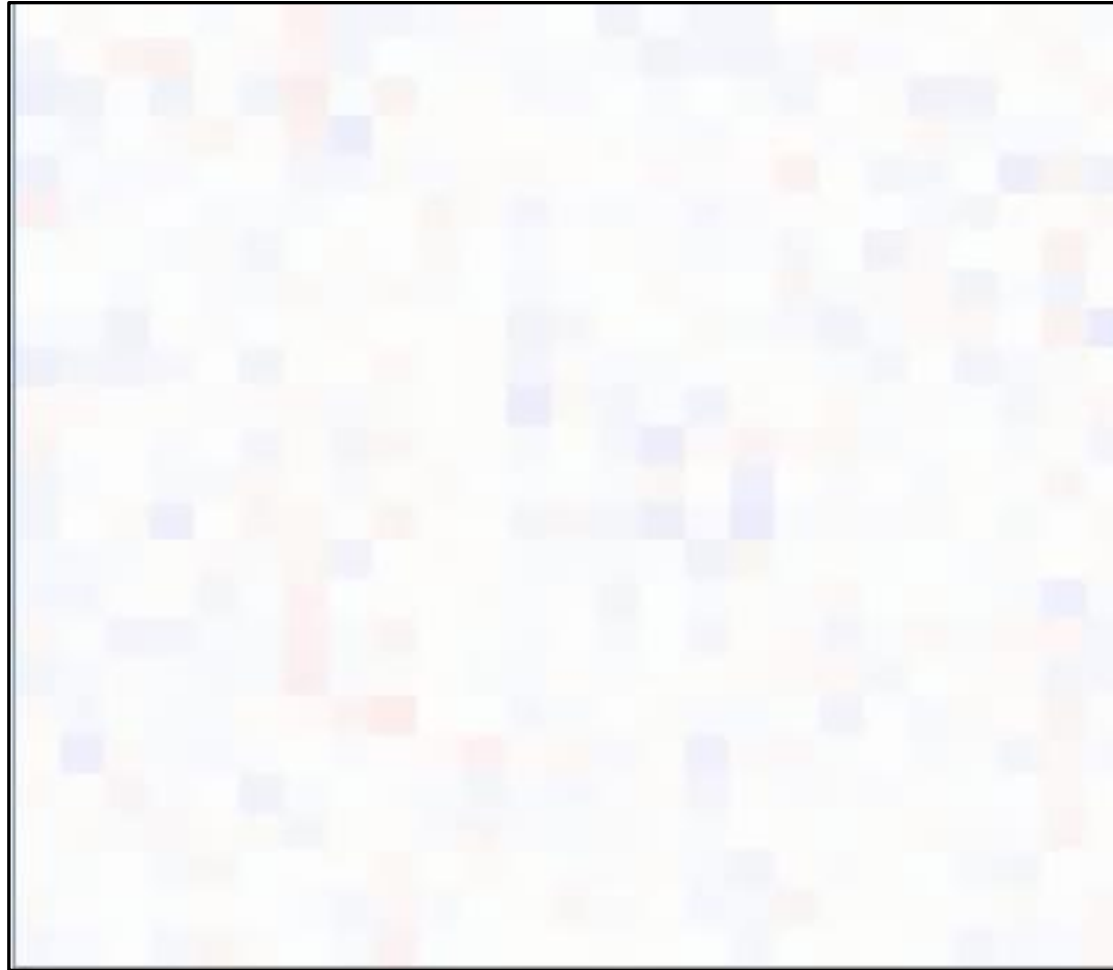
$N = 25$ agents

$\sigma = 0.3$

$\delta = 0.2$

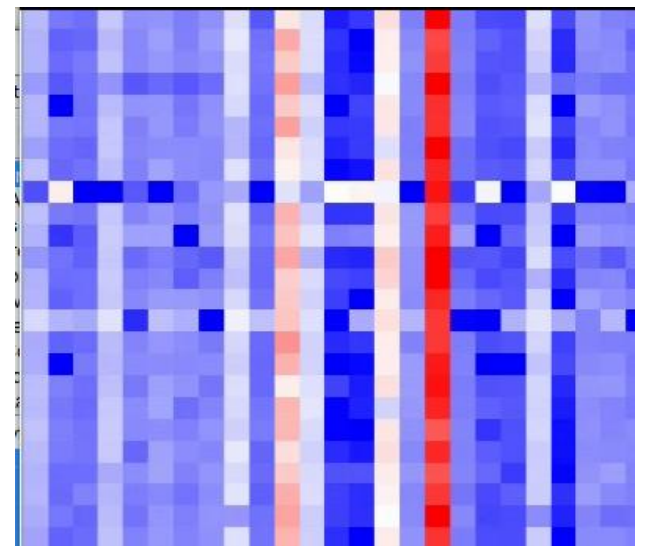
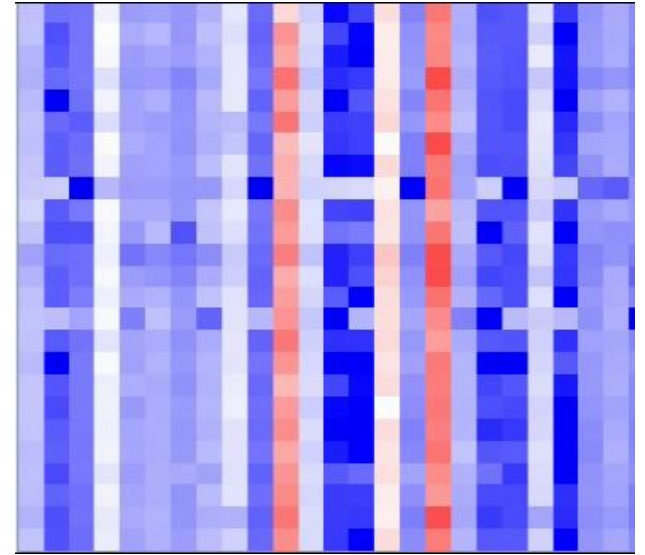
$\rho = 0.3$

$\omega = 0.1$



Emergence of a « dominant agent »

- A stage of mutual reinforcement helps two agents to grow
- One of the agents gets a self opinion close to 1, and then it feels not valued enough by the other and a negative reciprocity takes place



Discussion

- Different types of individuals can emerge (scape goats, dominant) without initial specific qualities because of randomness of interactions
- General tendency for positive self-opinion leads to average negative opinions
- Including gossips (original model) modifies the patterns
- The observed typical patterns may be useful to organise survey data (e.g. shcool class friendship network, Tamarit et al.)

Thanks !

Online applet:

<http://motive.cemagref.fr/lisc/leviathan/>

Sharpening sigmoid

$N = 25$ agents

$\sigma = 0.2$

$\delta = 0.2$

$\rho = 0.05$

$\omega = 0.1$



Depression cycles

- All agents loose all their friends
- After a while they get a low self-opinion
- Then they can get friends again
- They do it at different rhythm

