

Continuous Opinion Dynamics

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3

Continuous Opinion Dynamics	Jan Lorenz	ISI Torino	May 26, 2008	2 / 16
Introduction				





2 Continuous opinion dynamics under bounded confidence

3 Continuous opinion dynamics and movie ratings

4 Conclusion





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Introduction				

Continuous opinions

Prices, budgets



• Estimations: How many noodles?



• Political continuum: left-right



Source: sotomo.geo.unizh.ch, smartvote.ch . .

Ratings and grades



Source: IMDb.com

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Introduction				

Dynamics

- Agents may change opinion by **averaging** the opinions of others because of
 - informational reasons (in questions of fact finding)
 - compromising (in questions of negotiation)
 - normative reasons (in questions of taste)

 \implies Agents adjust towards opinions of others

- Mathematics of averaging agents
 - Opinions stabilise if¹
 - ★ agents have self-confidence
 - ★ confidence is mutual
 - ★ both properties do not fade away
 - Huge ammount of literature on finding consensus
 - * Important in coordination (swarming) of mobile autonomous agents
 - * Related to synchornisation

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¹Lorenz, Physica A, 2005

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Continuous opinion dynamics under	bounded confidence			

Outline



2 Continuous opinion dynamics under bounded confidence

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4 Conclusion





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Continuous opinion dynamics under	bounded confidence			

Bounded confidence models²



 2 Krause, 1997; Deffuant et al, 2000; Hegselmann-Krause, 2002; Weisbuch et al, 2002 \mathbb{P} + $+ \mathbb{P}$ + $+ \mathbb{P}$ + $- \mathbb{P}$ - $- \mathbb{P}$

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Bifurcation diagrams³

HK and DW model: bifurcation diagram



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Heterogeneous bounds of confidence⁴

0.8 opinion space 0.6 - 0.22 0.4 0.2 = 0.11 ĭο. 20000 40000 60000 80000 100000 ε = 0.11 (500 agents), 0.22 (500 agents) 0.8 opinion space 0.6 0.4 0.2 n 10000 20000 30000 40000

ε = 0.11 (500 agents), 0.22 (500 agents)





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⁴Lorenz, arXiv, 2008

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Continuous Opinion Dynamics	Jan Lorenz	ISI Torino	May 26, 2008	9 / 16
Continuous opinion dynamics and m	ovie ratings			

Outline



2 Continuous opinion dynamics under bounded confidence

Ontinuous opinion dynamics and movie ratings

4 Conclusion





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Continuous opinion dynamics and movie r	atings			

Opinion dynamics about movie quality

- On IMDb.com 1,086 movies got more than 20,000 votes (1=awful,...,10=excellent)
- <u>Probabilistic view</u>: Cinemagoer's initial opinion is a random variable
- Mini social theory: Final opinion is the average of opinions of peers.

Votes	Percentage	Rating
981	17.9%	6 10
562	10.3%	9
898	16.4%	8
1,014	18.5	% 7
720	13.1%	6
418	7.6%	5
258	4.7%	4
181	3.3%	3
133	■ 2.4%	2
311	5.7%	1

- Probabilistic theory: Aggregate distribution should be close to a Levy skew α -stable distributions distribution.
 - has characteristic function

$$\varphi(t;\alpha,\beta,\gamma,\mu) = \exp\left[\mu - |\sigma t|^{\alpha} \left(1 - i\beta \operatorname{sign}(t) \tan(\frac{\pi \alpha}{2})\right.\right]$$

▶ $\alpha \in]0,2]$, , $\beta[-1,1]$, $\gamma \in [0,\infty[$, and $\mu \in]-\infty,\infty[$

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Continuous opinion dynamics and movie r	atings			

Confined and discretized stable distribution



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Continuous opinion dynamics and movie ratings				

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One parameter fit



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Conclusion				





2 Continuous opinion dynamics under bounded confidence

Continuous opinion dynamics and movie ratings







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Conclusion				

Conclusion

- Continuous opinion dynamics is different from discrete opinion dynamics
- Averaging dynamics
 - and bounded confidence: Gives a hint on the formation of political parties without a priori definition of parties
 - could explain the 'Gaussian-like' shapes of movie rating histograms, but initial distributions must have fat tails

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Conclusion				

References



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