A Kinetic Study of Opinion Dynamics in Multi-Agent Systems

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Introduction

Opinion Evolution

Opinion evolution in a multi-agent system is modeled using a kinetic approach.

Sociophysics

- Kinetic theory of gases describes the effects of interactions among molecules in a gas from a microscopic viewpoint.
- By reinterpreting the molecules of a gas as agents, one can use the kinetic framework to describe social interactions in a multi-agent system.

Microscopic Model

Binary Interactions

The opinions of two interacting agents change according to

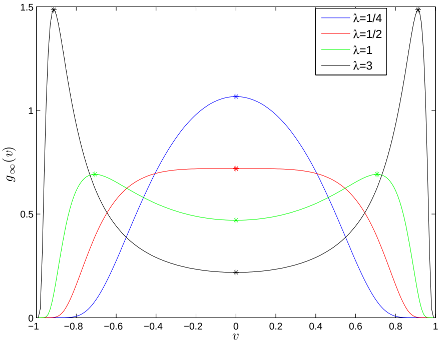
$$\begin{cases} v' = v + \gamma C(|v|)(w - v) + \eta_* D(|v|) \\ w' = w + \gamma C(|w|)(v - w) + \eta D(|w|) \end{cases} \tag{1}$$

where

- (v', w') are the post-interaction opinions of the two agents whose pre-interaction opinions are (v, w);
- $\gamma \in (0, 1/2)$;
- η and η_* are two independent random variables with distribution function $\vartheta(\cdot)$;
- $C(\cdot)$ is the compromise function ($C(|v|) = 1$);
- $D(\cdot)$ is the diffusion function ($D(|v|) = 1 - v^2$).

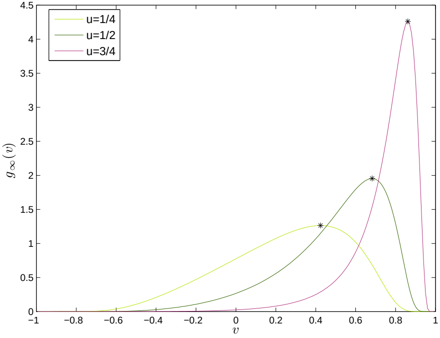
u=0

- u: average opinion;
- v: opinion;
- $g_\infty(v)$: stationary profile;
- λ: constant related to compromise and diffusion.



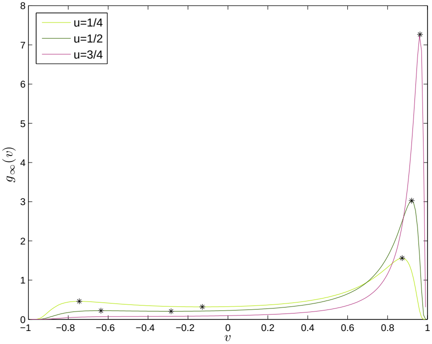
$\lambda = 1/4$

- u: average opinion;
- v: opinion;
- $g_\infty(v)$: stationary profile;
- λ: constant related to compromise and diffusion.



$\lambda = 3/2$

- u: average opinion;
- v: opinion;
- $g_\infty(v)$: stationary profile;
- λ: constant related to compromise and diffusion.



Thank you for your attention

Simulations of Opinion Formation in
Multi-Agent Systems using Kinetic Theory

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