

The Cognitive Cost of Ethnocentrism

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August 13th, 2010



McGill

*The Robert J. Glushko and
Pamela Samuelson
Foundation*



**NSERC
CRSNG**

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Brown (2004) *Daedalus*

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- But ethnocentrism is observed in individuals with minimal cognition!
 - Human placenta, ants, microbes (Biology: known as Green-beard effect)

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West et al (2006) *Nature Rev. Microbiology*

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- But ethnocentrism is observed in individuals with minimal cognition!
 - Human placenta, ants, microbes (Biology: known as Green-beard effect)
- Ethnocentrism may have a basis in evolution

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Method

- How can we ask theoretical questions about evolution?

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- Build computational models and simulate them

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- Use tools from evolutionary game theory to model interactions between agents

Competitive Environment

Prisoner's dilemma

Alice



Competitive Environment

Prisoner's dilemma

Bob



Alice



Competitive Environment

Prisoner's dilemma

Bob



b - c

Alice



b

Competitive Environment

Prisoner's dilemma

Bob



$-c$



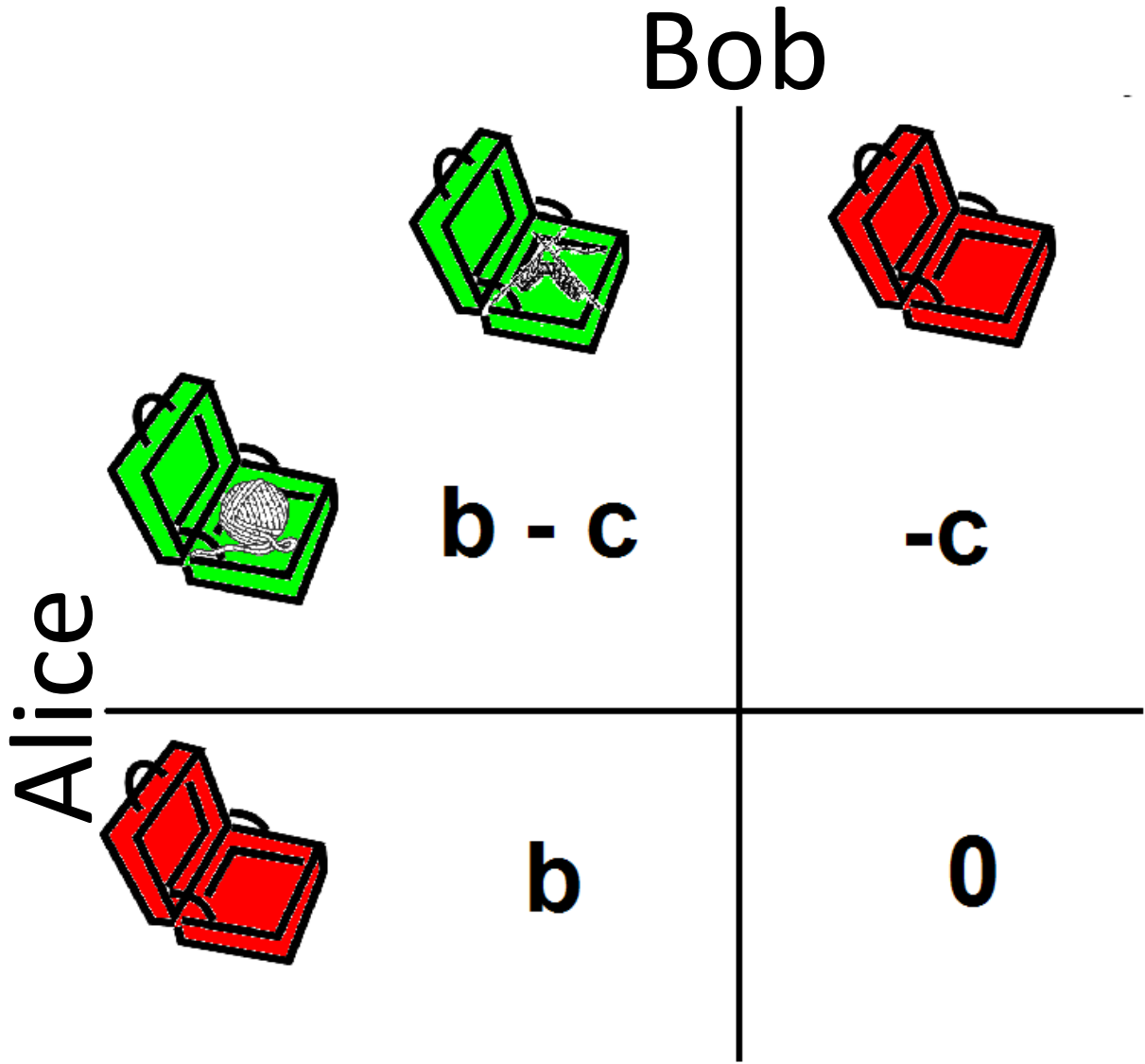
Alice



0

Competitive Environment

Prisoner's dilemma

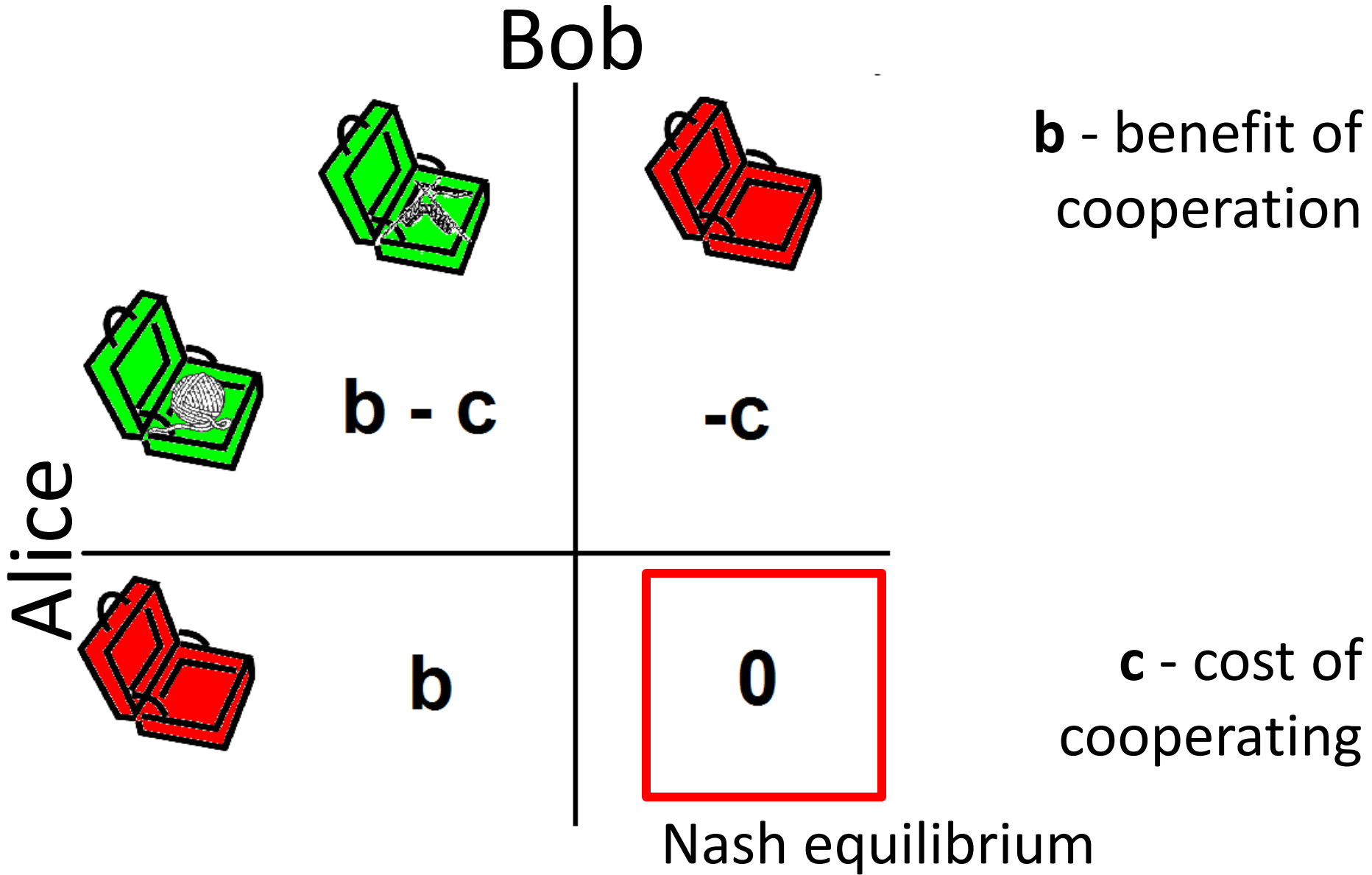


b - benefit of cooperation

c - cost of cooperating

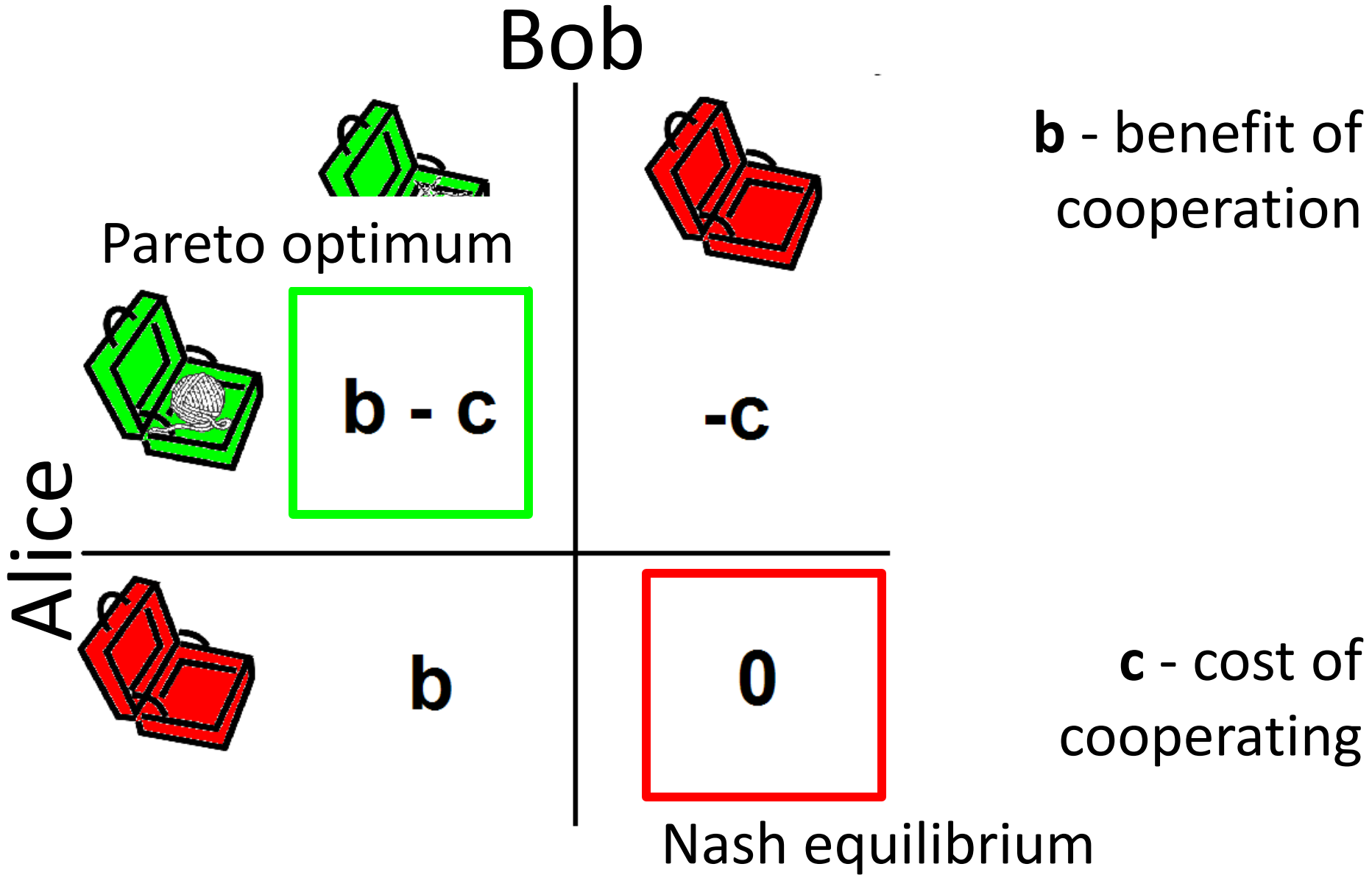
Competitive Environment

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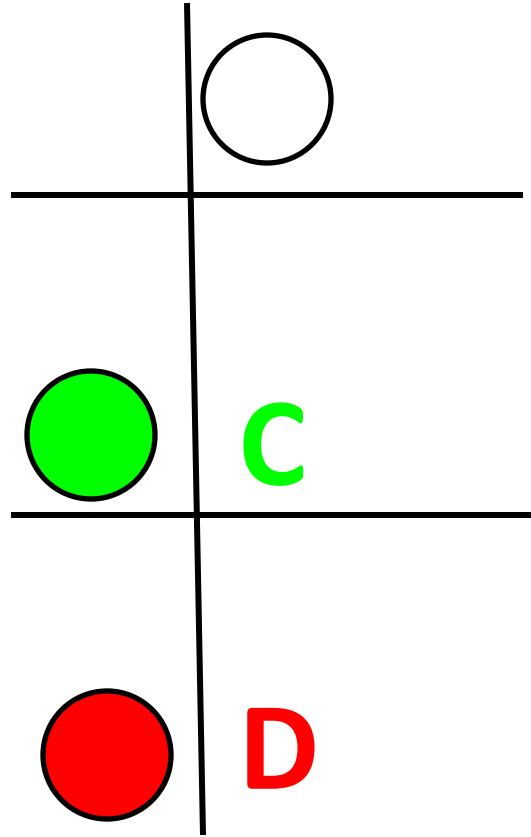


Competitive Environment

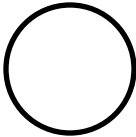
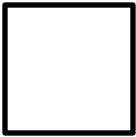
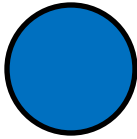
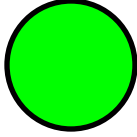
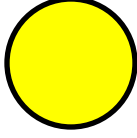
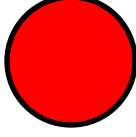
Prisoner's dilemma



Strategy Space



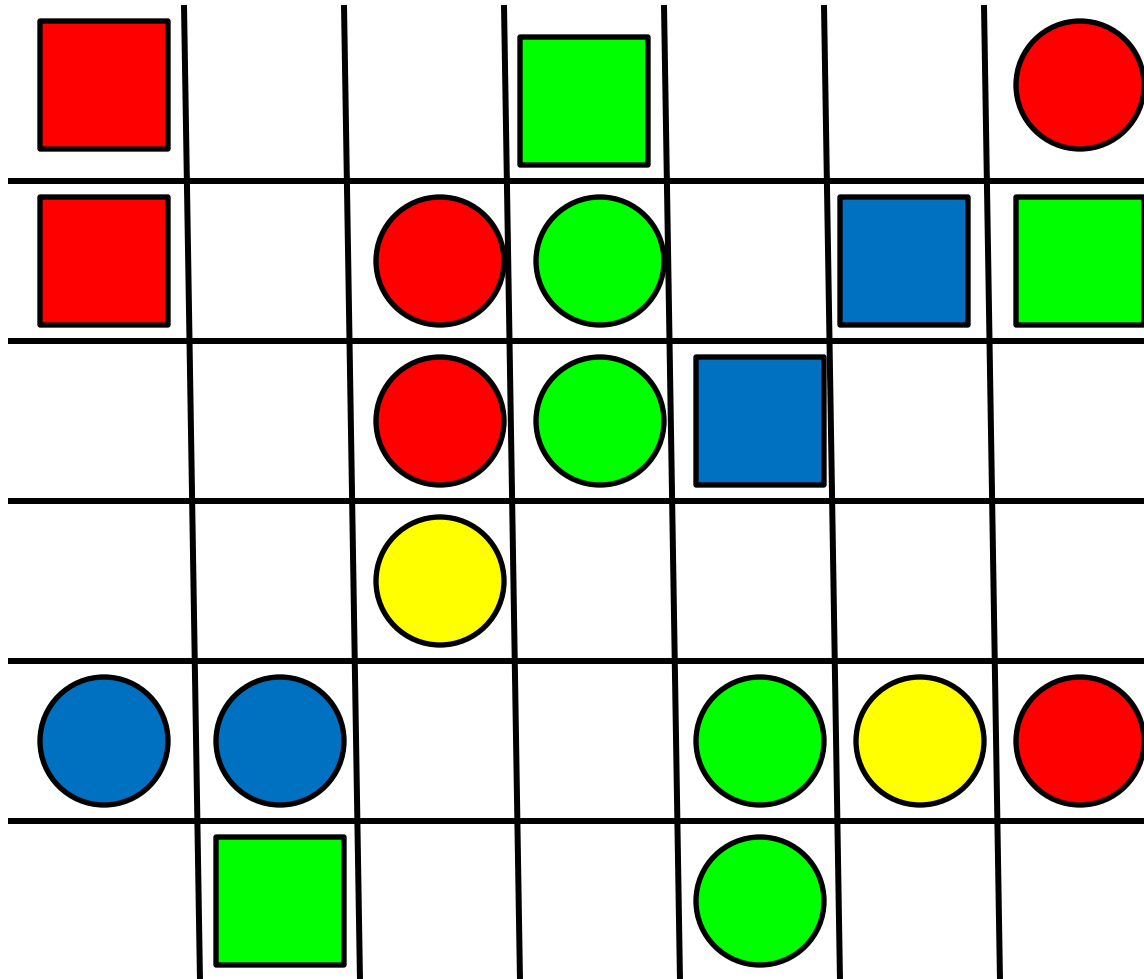
Strategy Space

		
	C	C
	C	D
	D	C
	D	D

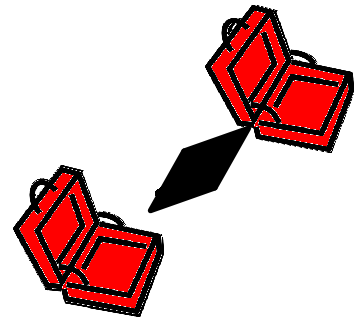
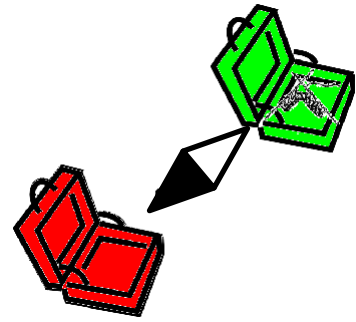
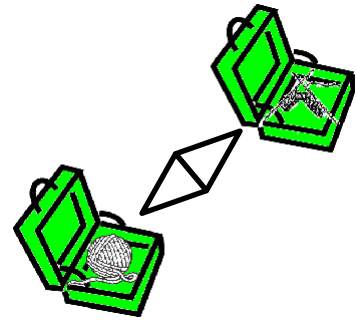
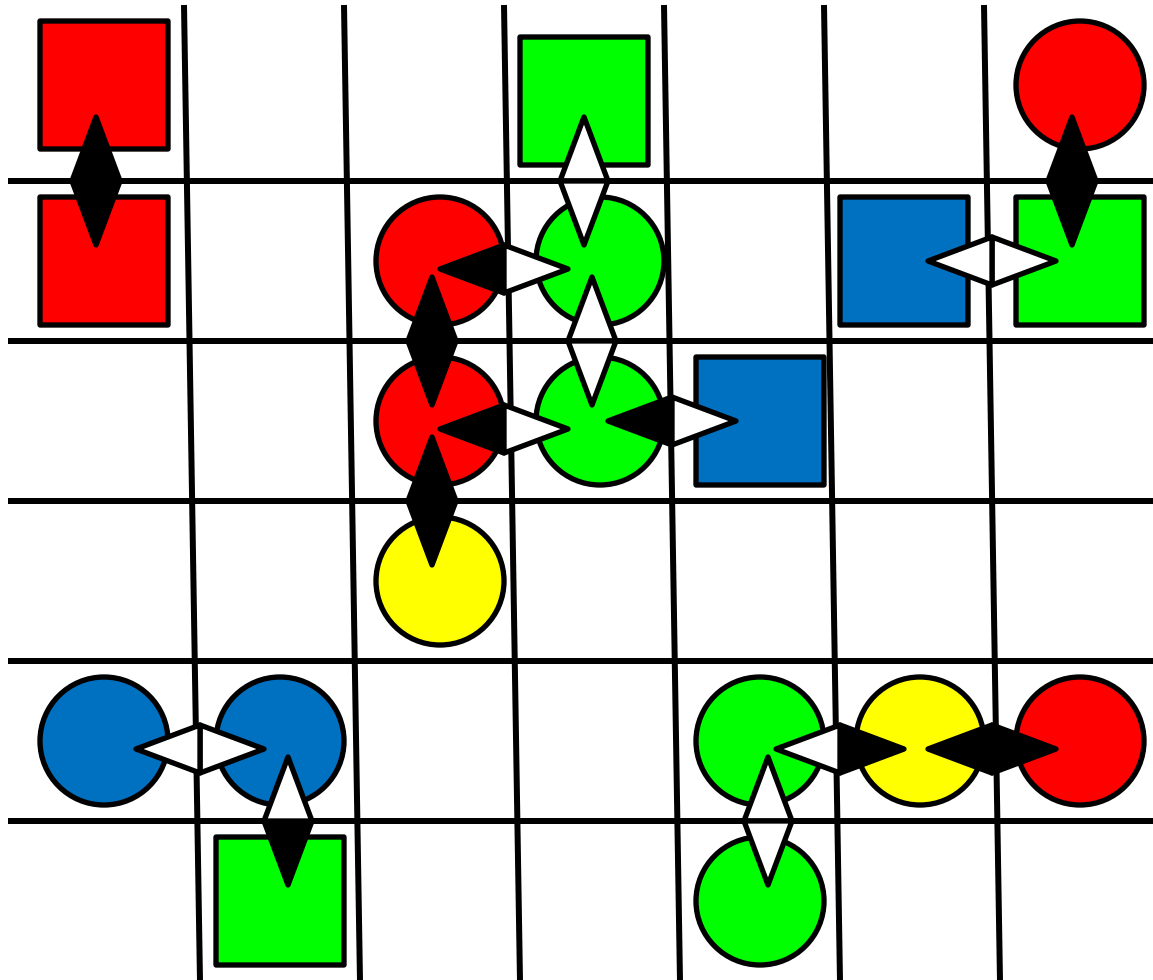
Strategy Space

	○	□
●	C	C
●	C	D ← Ethnocentrism
●	D	C
●	D	D

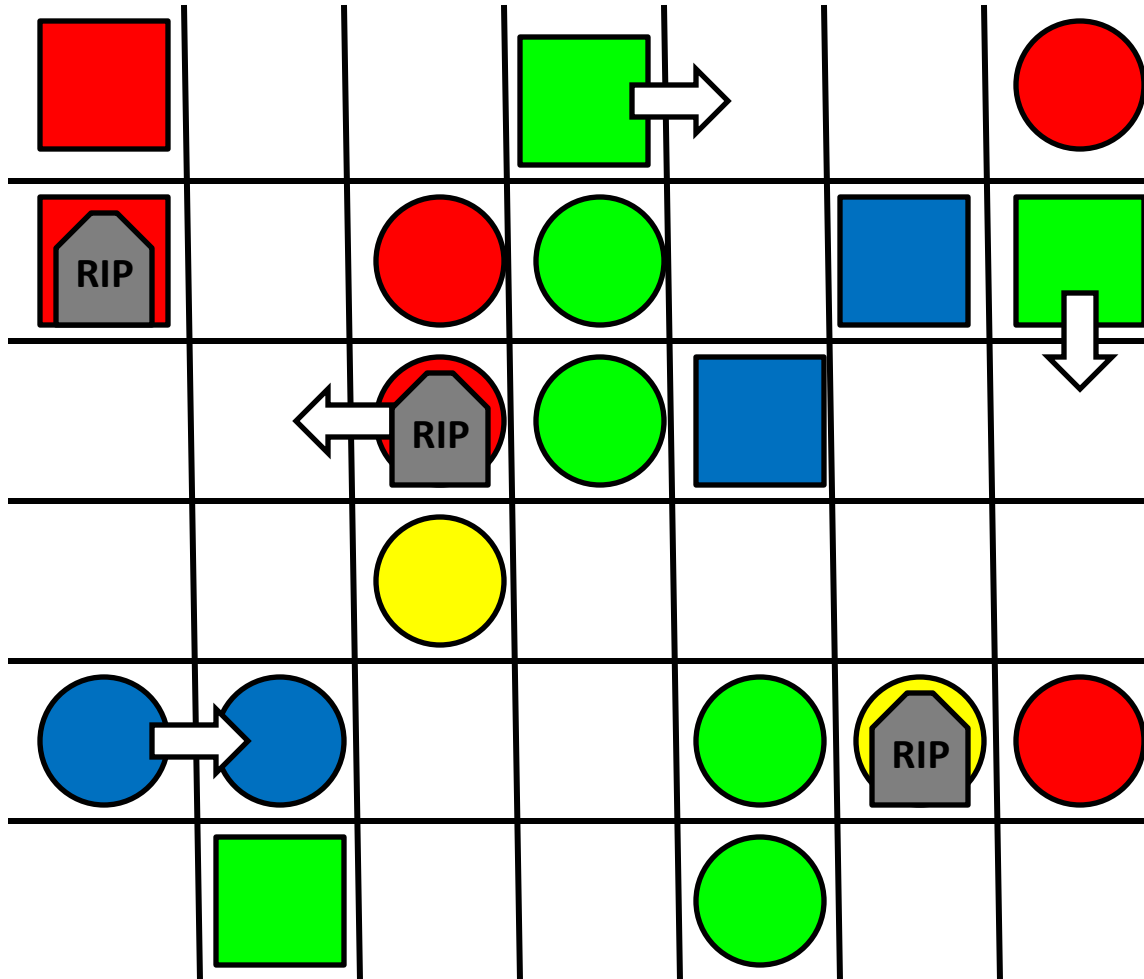
Spatial Model



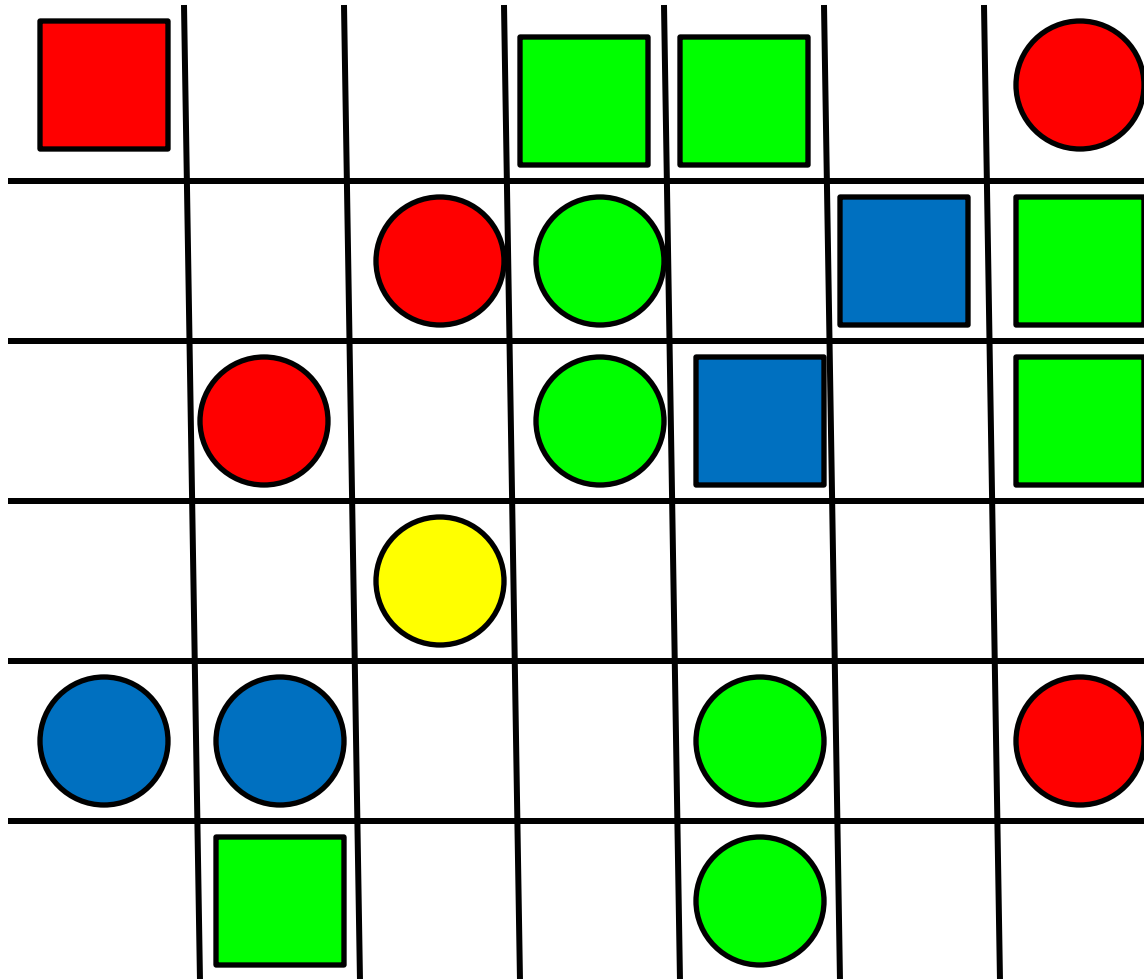
Spatial Model



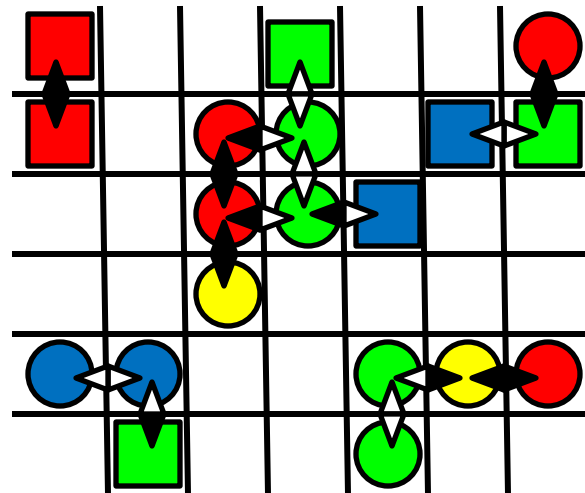
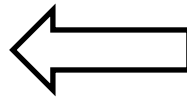
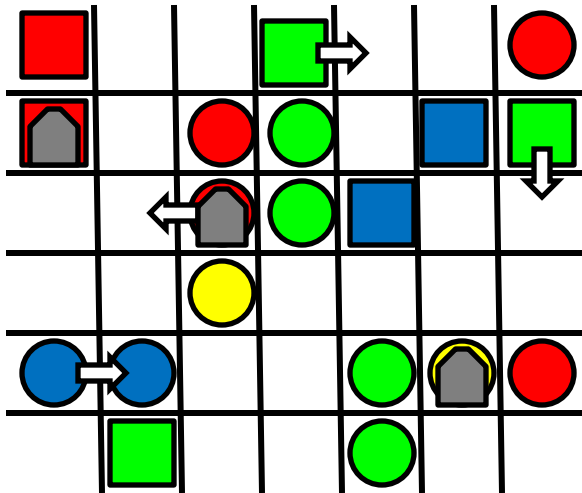
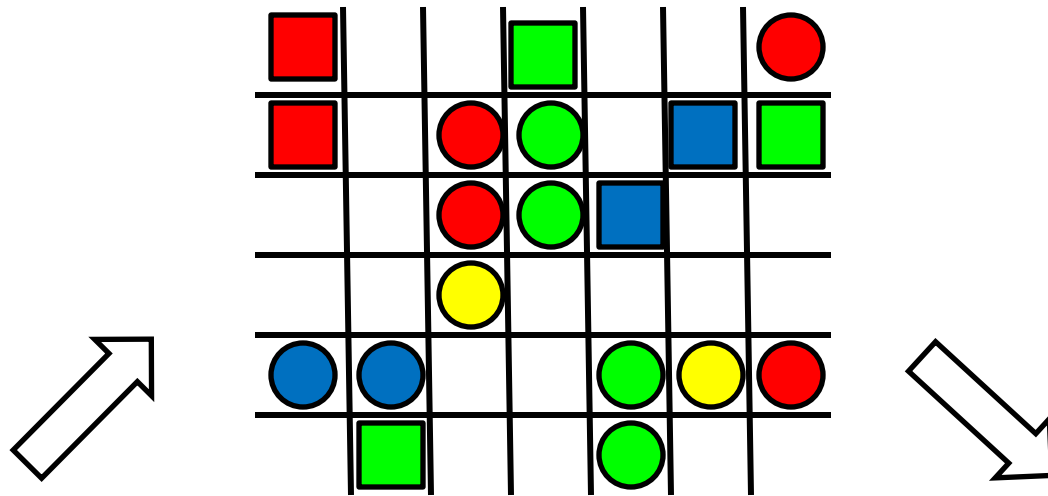
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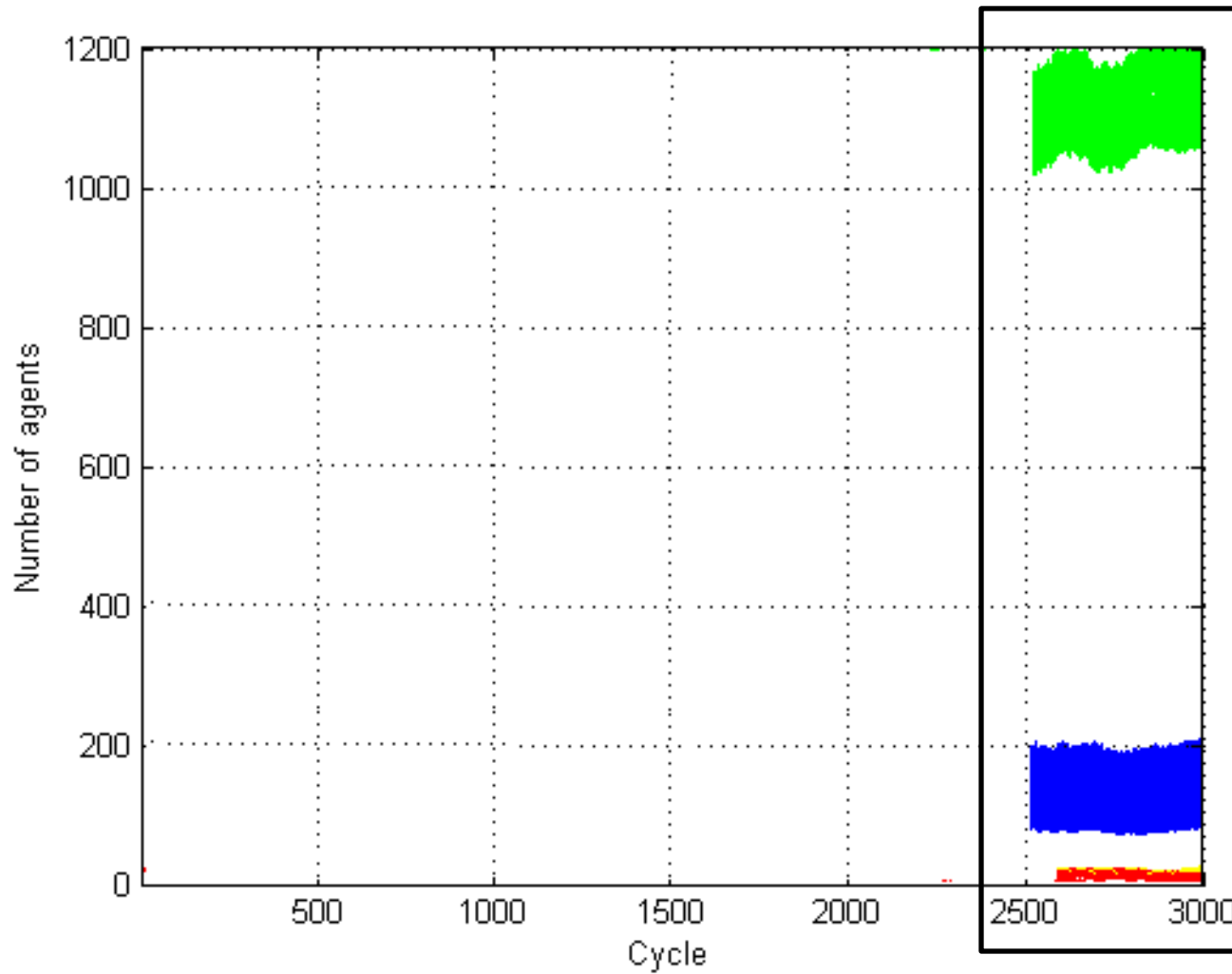
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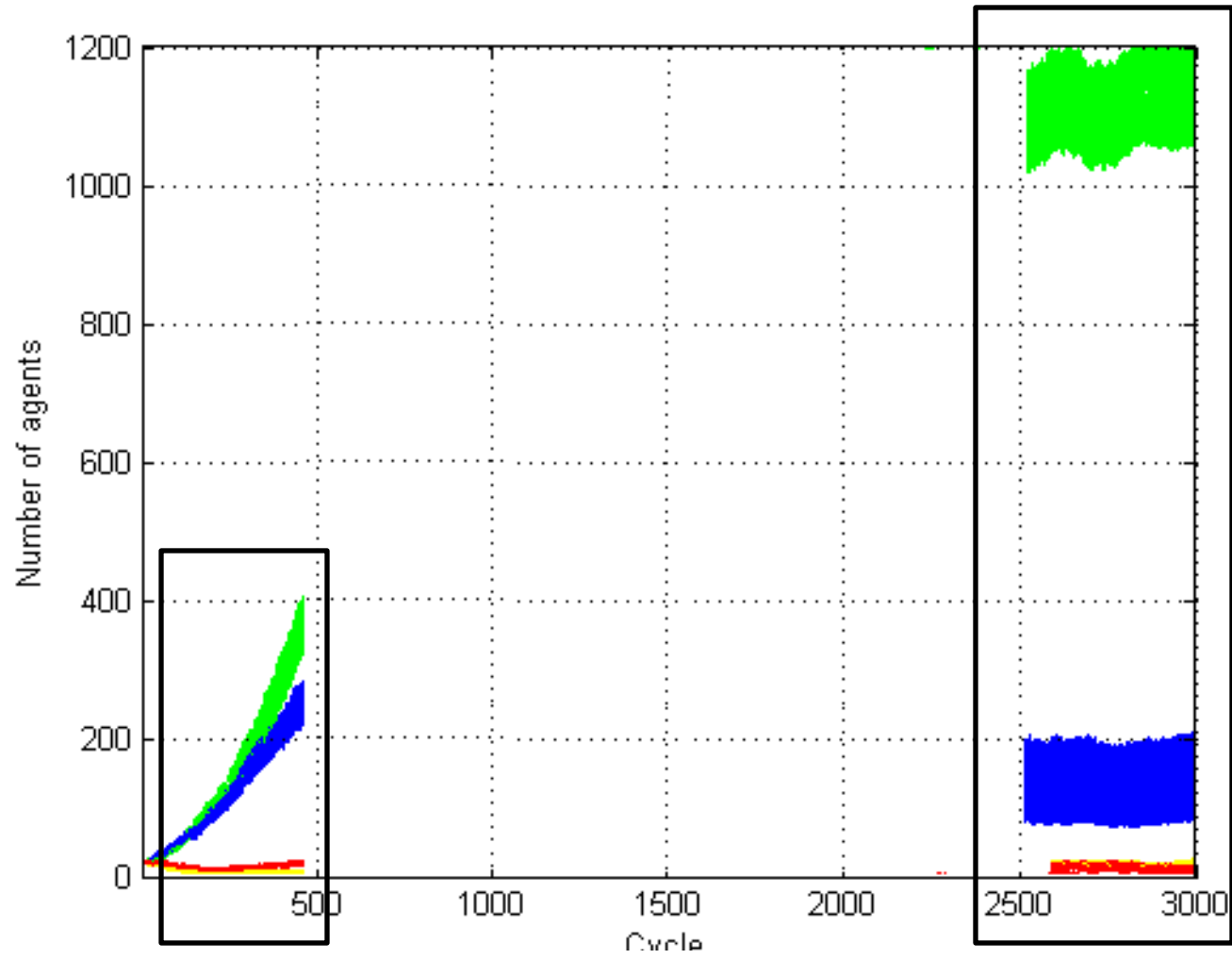
Previous Results



ptr = 0.1
death = 0.1
b = 0.025
c = 0.01

Hammond & Axelrod (2006)
Journal of Conflict Resolution

Previous Results

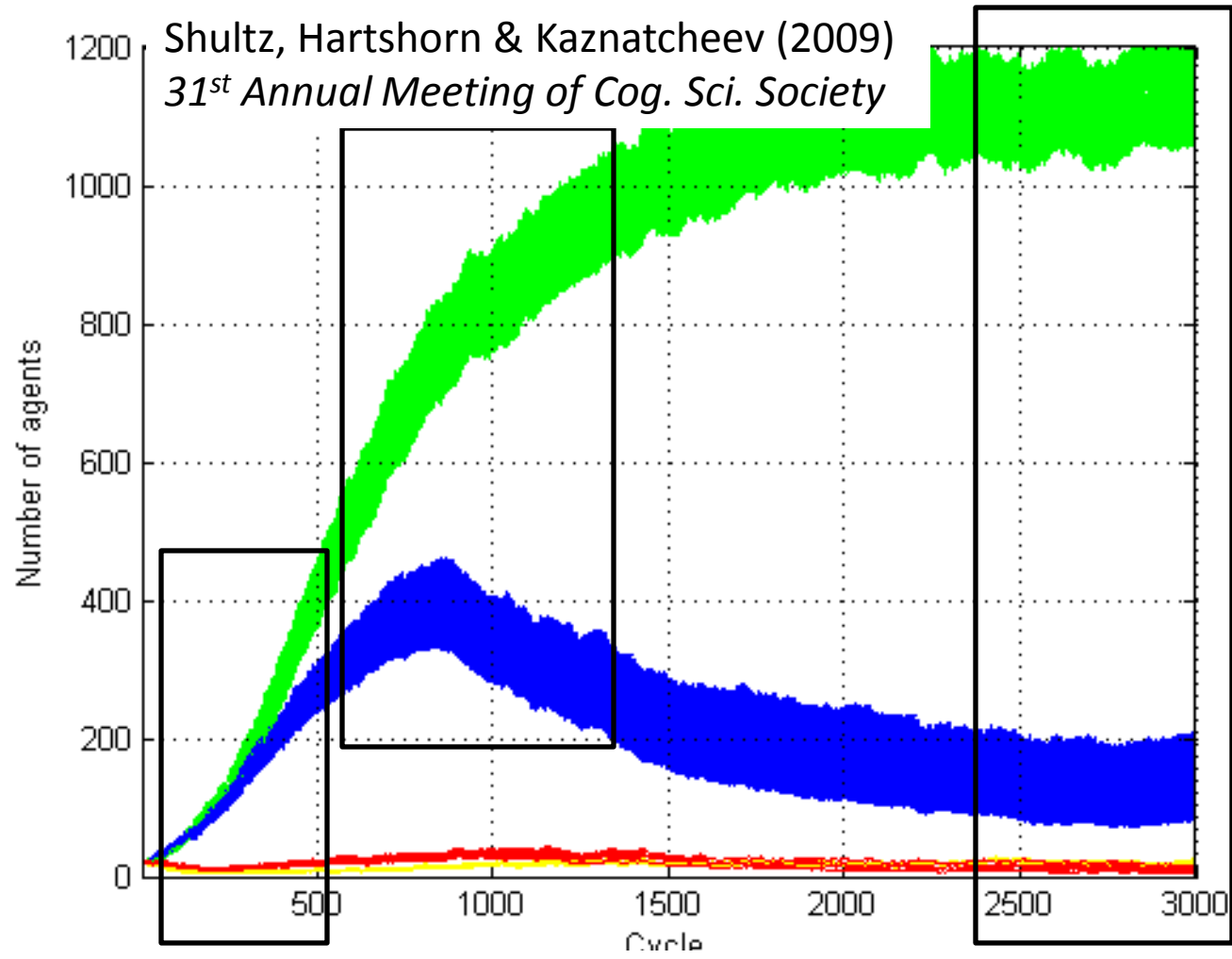


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Shultz, Hartshorn & Hammond (2008)
30th Annual Meeting of Cog. Sci. Society

Hammond & Axelrod (2006)
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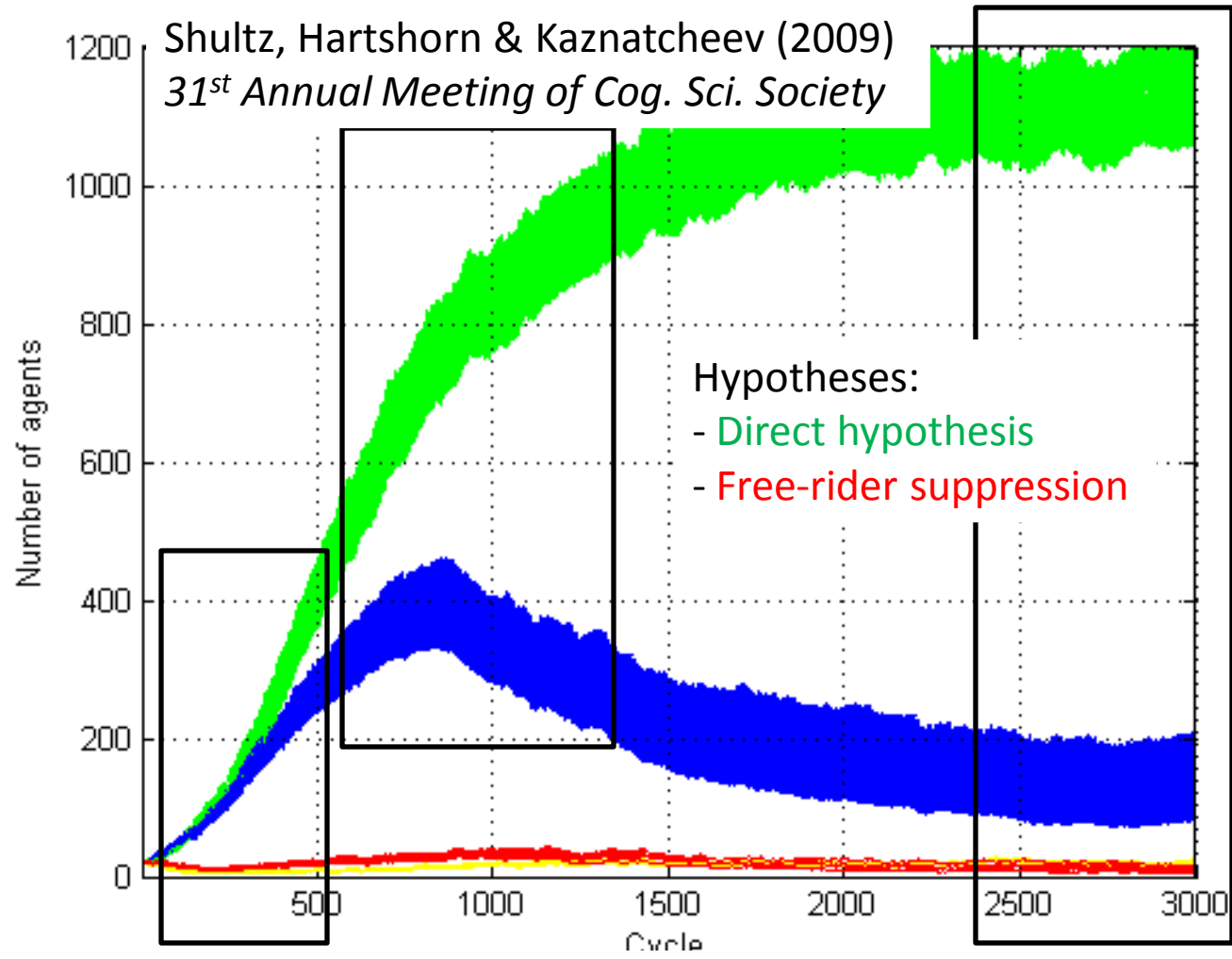


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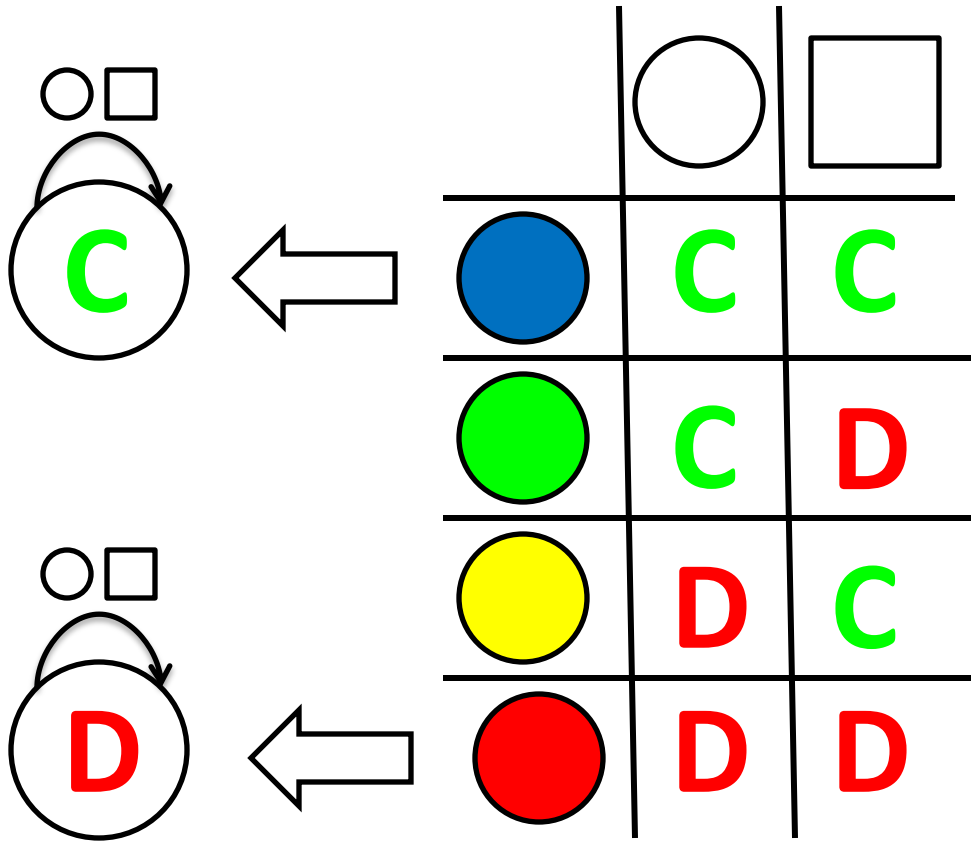
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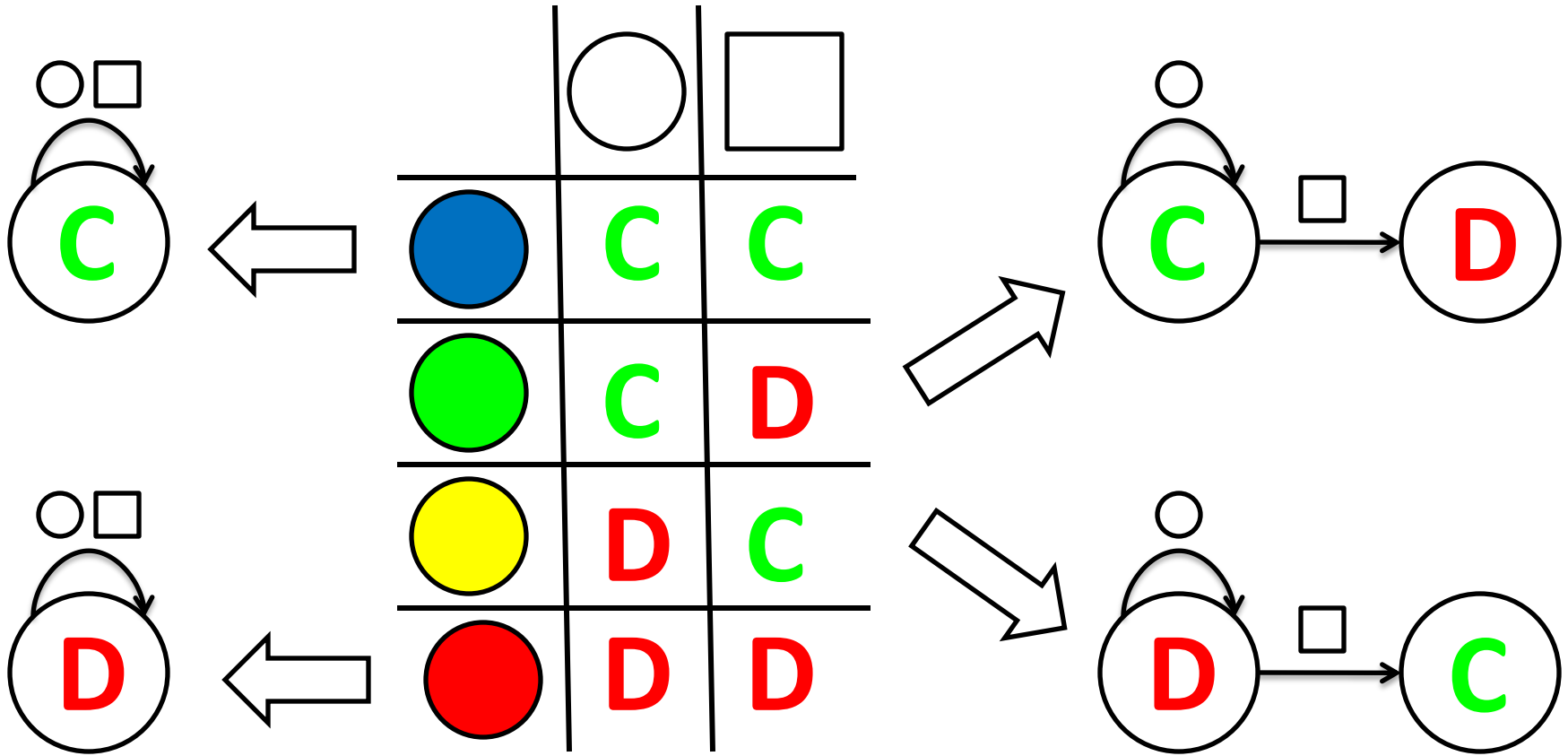
Cognitive Complexity

	○	□
●	C	C
●	C	D
●	D	C
●	D	D

Cognitive Complexity

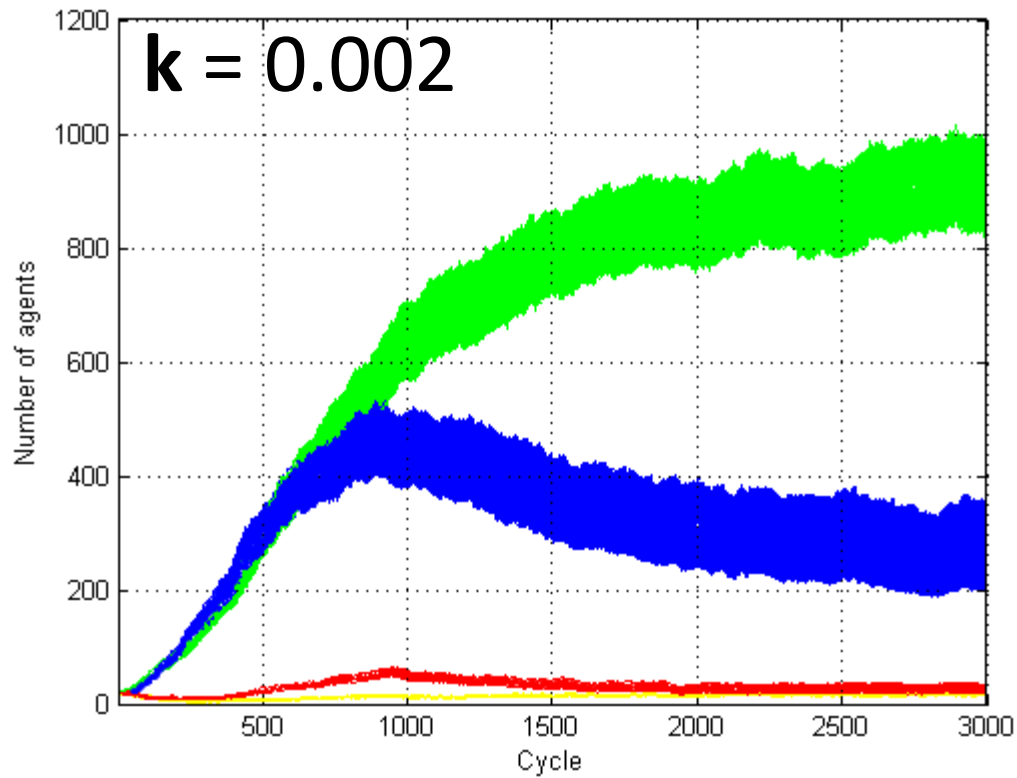


Cognitive Complexity



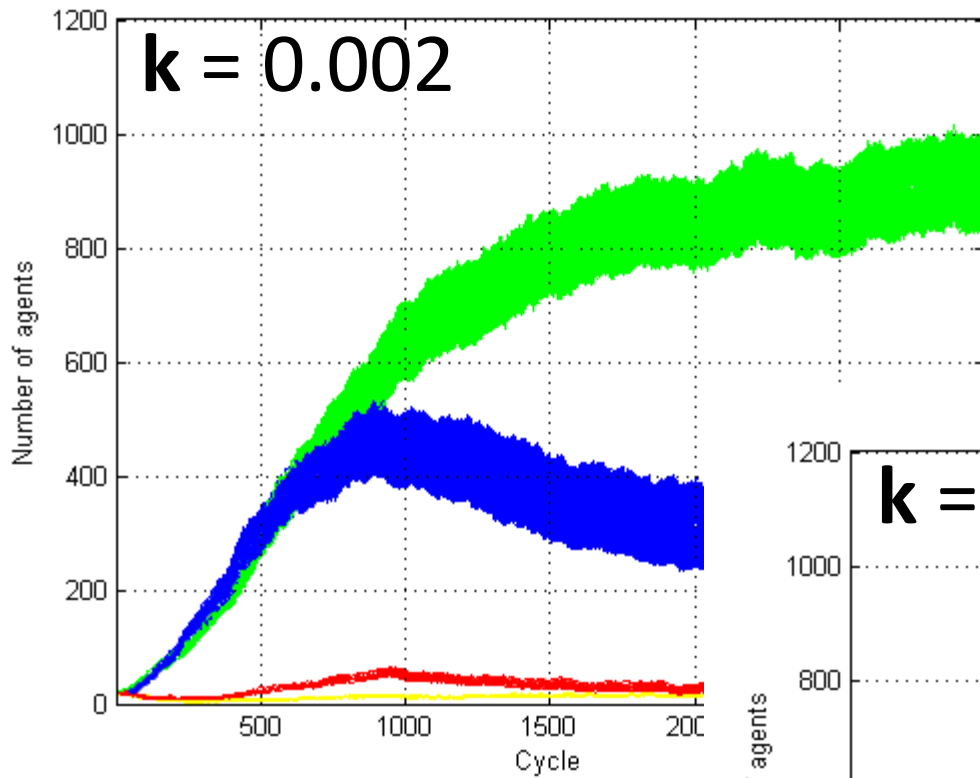
Associate a cost **k** with the extra complexity

Vary k

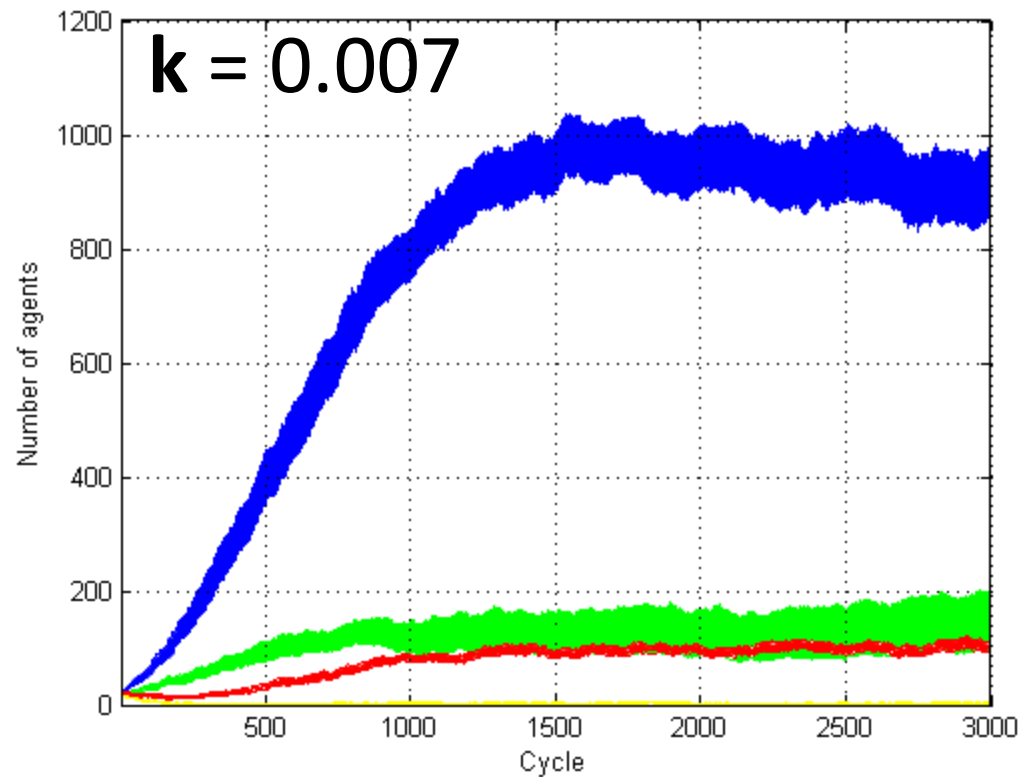


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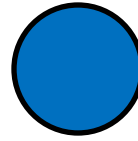
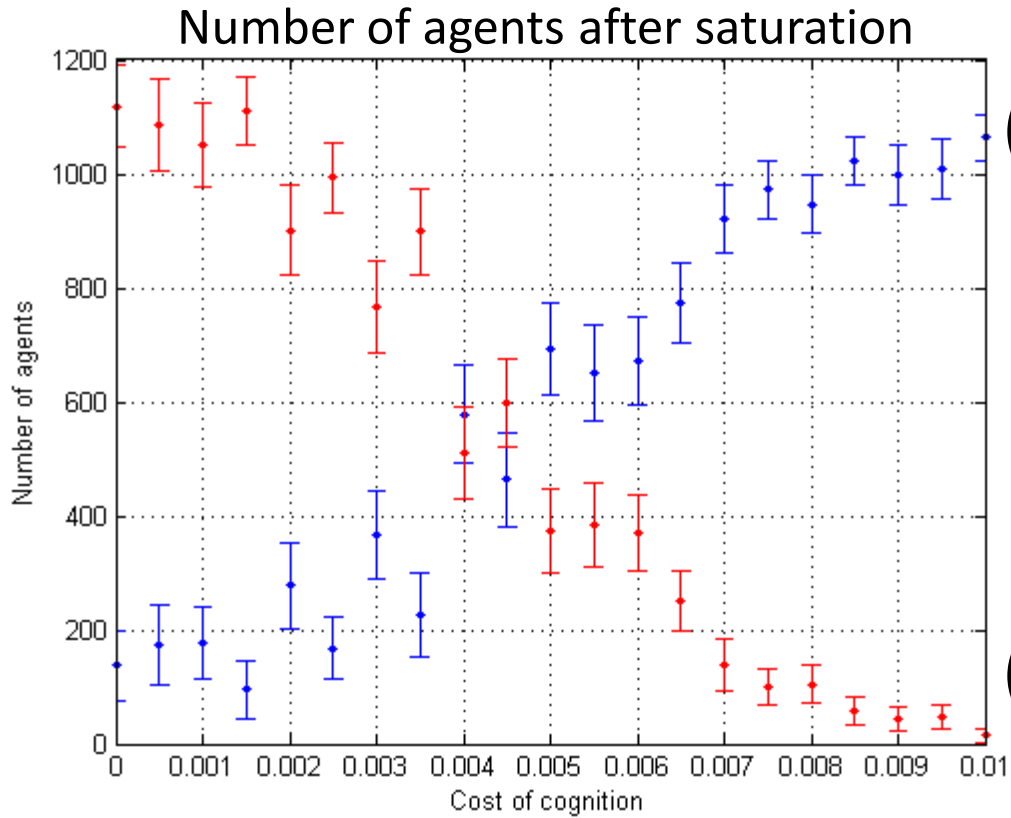
Vary k



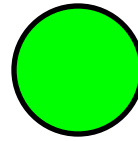
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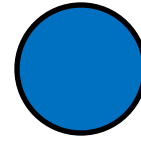
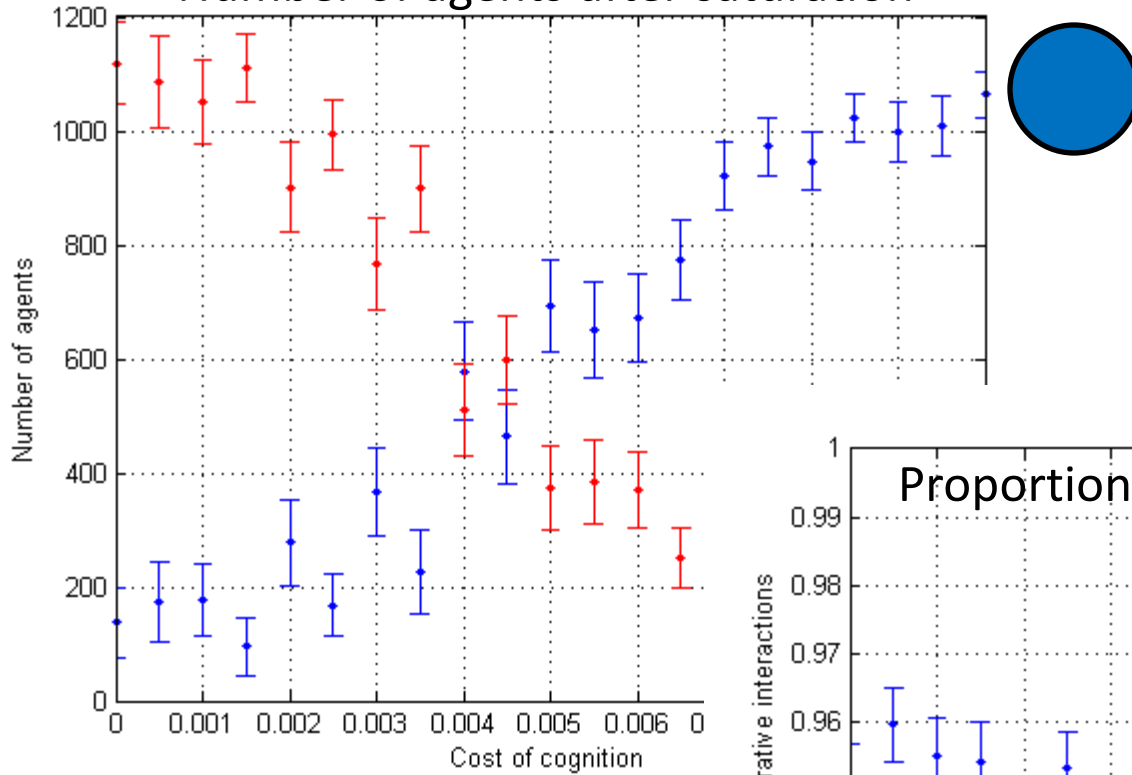


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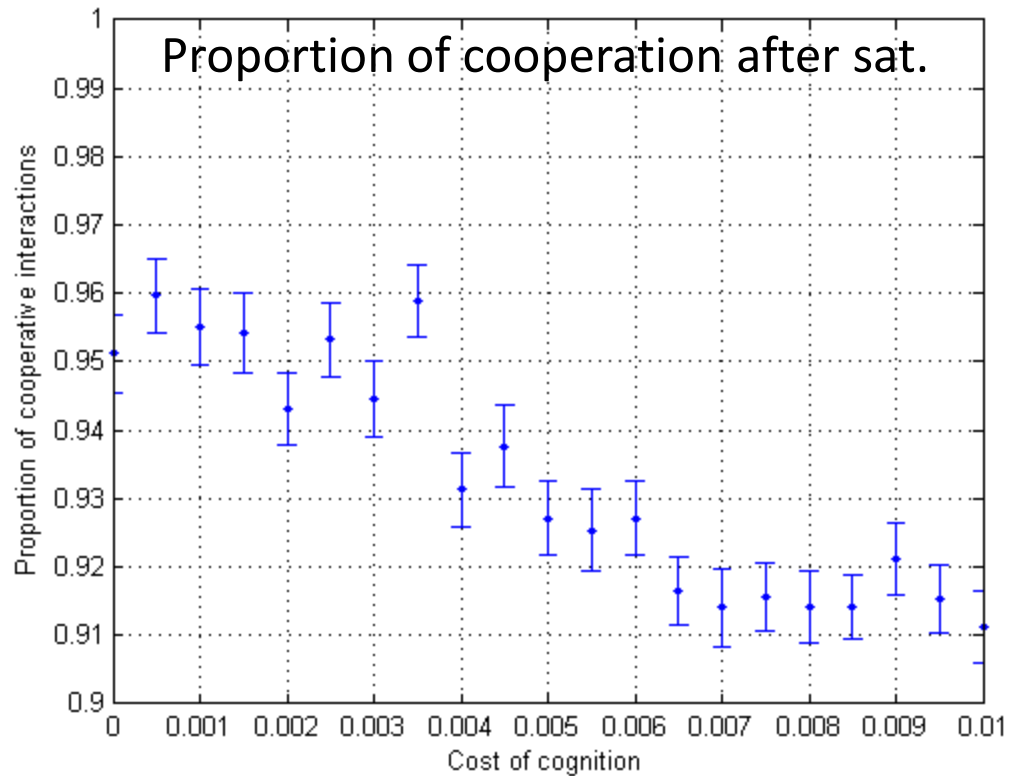


Vary k

Number of agents after saturation



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Conclusion

- Ethnocentrism evolves in a very simple model
- Low cost of cognition for phase transition suggests ethnocentrism is not robust against cognitive complexity
- Cognitive mechanism must be
 - Really inexpensive, or
 - Be in place already
- Ethnocentrism maintains higher levels of cooperative interactions: should we rethink or biases?

Future Directions

- Are there simple non-spatial models that encourage ethnocentrism (or the green-beard effect)?

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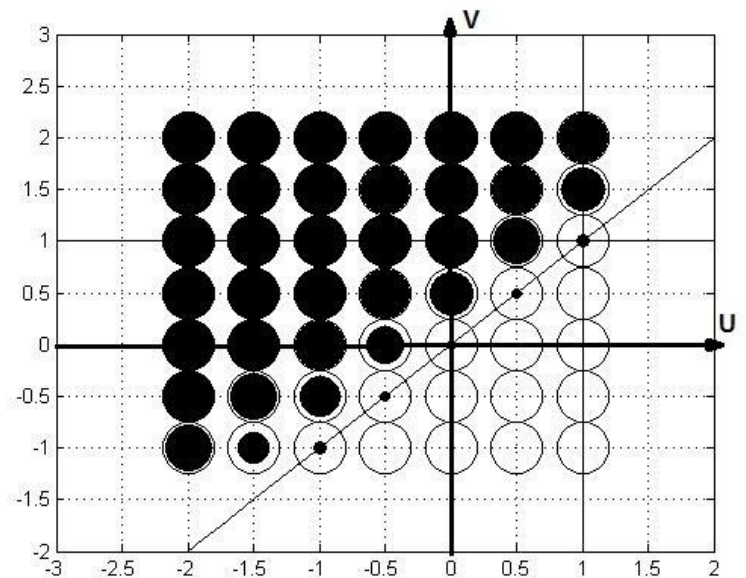
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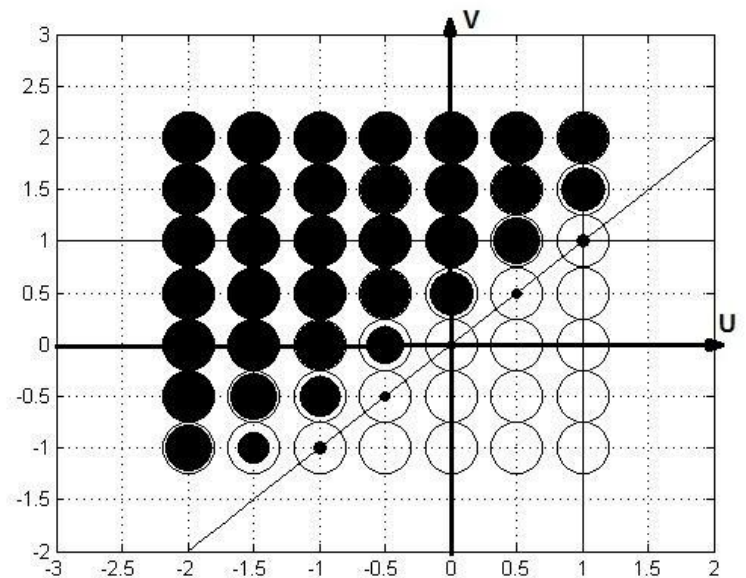


Antal, Ohtsuki, Wakeley, Taylor, & Nowak (2009) *PNAS*

Kaznatcheev (2010) *Complex Adaptive Systems – AAAI*

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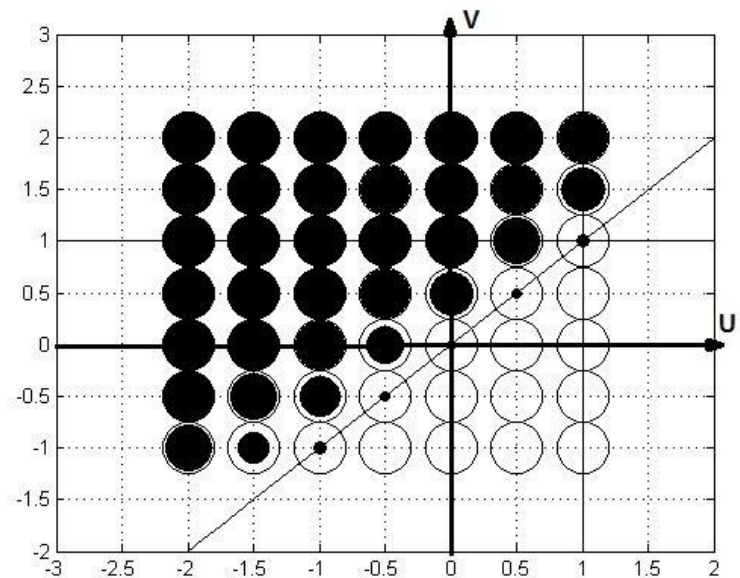
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Thank you for listening!



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