Evolutionary Stable Strategies

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Outline

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Biology and Game Theory

- GT influence in biology

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- Strategies - Genes

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- Payoffs - Genetic Fitness

Biology and Game Theory

- GT influence in biology
- Strategies - Genes
- Payoffs - Genetic Fitness
- Reproduction: Asexual vs Sexual (GT point of view)

Specific definitions

- Monomorphic vs Polimorphic Populations

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- Random Mutations & Matching

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Definition (Evolutionary Stability)

Consider a large population all of whom are playing the same strategy. The strategy is called evolutionarily stable if any small mutation playing a dierent strategy would die out

Outline

Game

Frame subtitles are optional. Use upper- or lowercase letters.

	C	D
C	2;2	0;3
D	3;0	1;1

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- What are NE (reminder)?

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- What are NE (reminder)?
- Evolutionary Stable Strategies...

Conclusions

- Strickly Dominated Strategies are not ESS

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- ESS are NE

Conclusions

- Strickly Dominated Strategies are not ESS
- ESS are NE
- Nature sucks sometimes

Outline

NE and GSS

	A	B
A	a;a	0;a
B	a;0	0;0

NE and GSS

	A	B
A	a;a	0;a
B	a;0	0;0

- NE is not sufficient condition for ESS

Invading Gene and ESS

	A	B	C
A	2;2	1;1	1;1
B	1;1	1;1	1;0
C	1;1	0;1	1,1

Invading Gene and ESS

	A	B	C
A	2;2	1;1	1;1
B	1;1	1;1	1;0
C	1;1	0;1	1,1

- Invader is not necessary ESS

Outline

Game

	A	D
A	0;0	1;2
D	2;1	0;0

Game

	A	D
A	0;0	1;2
D	2;1	0;0

- No Symetric ESS

Game

	A	D
A	0;0	1;2
D	2;1	0;0

- No Symetric ESS
- Mixed Strategy Symetric Equilibrium

Social Conventions as Correlated Equilibria

	L	R
L	1;1	0;0
R	0;0	2;2

Hawk & Doves and Evolutionary Stable Startegies

	H	D
H	$(\frac{V-c}{2}; \frac{V-c}{2})$	$(V; 0)$
D	$(0; V)$	$(\frac{V}{2}; \frac{V}{2})$

Hawk & Doves and Evolutionary Stable Startegies

	H	D
H	$(\frac{V-c}{2}; \frac{V-c}{2})$	$(V; 0)$
D	$(0; V)$	$(\frac{V}{2}; \frac{V}{2})$

- Identification $(\frac{V}{c})$

Summary

- Monomorphic Games
- Polimorphic Games
- Social Conventions