

Stochastic individual-based models
with power law mutation rate
on a general finite trait space

Joint work with A. Kraut (Bonn) and C. Smadi (Grenoble)

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Counter-intuitive examples

- 1 Large jumps
- 2 Longer or shorter path than expected
- 3 Counter cycle

Arbitrary large jumps



● > ●, ●

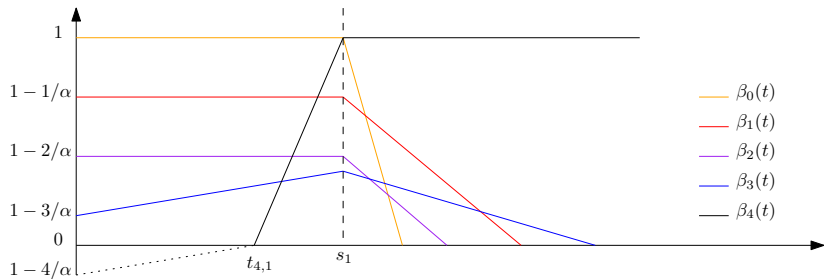
● < ●

● ≪ ●

$$3 < \alpha < 4$$

$$\frac{1}{f_{\bullet\bullet}} + \frac{-1 + 4/\alpha}{f_{\bullet\bullet}} < \frac{3/\alpha}{f_{\bullet\bullet}}$$

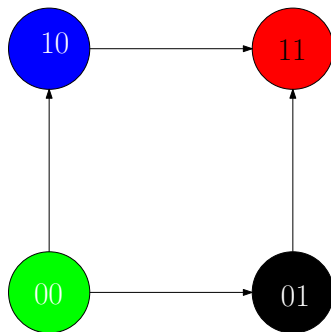
Arbitrary large jumps



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Sequence of resident traits longer or shorter "than expected"



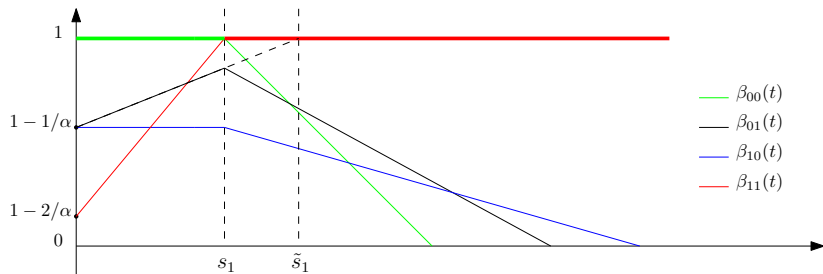
start = ●, end = ●

$\alpha > 2$

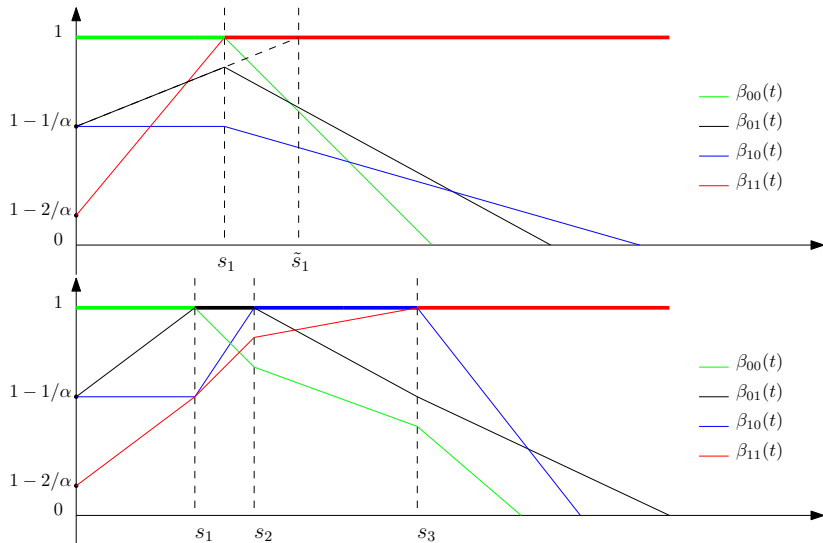
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● < ●

Sequence of resident traits longer or shorter "than expected"



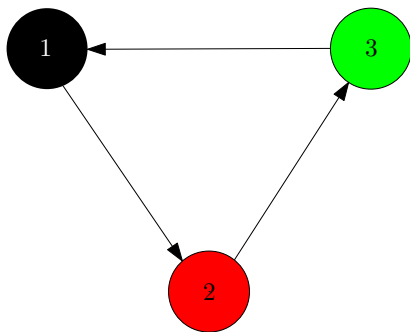
Sequence of resident traits longer or shorter "than expected"



Counter-intuitive examples

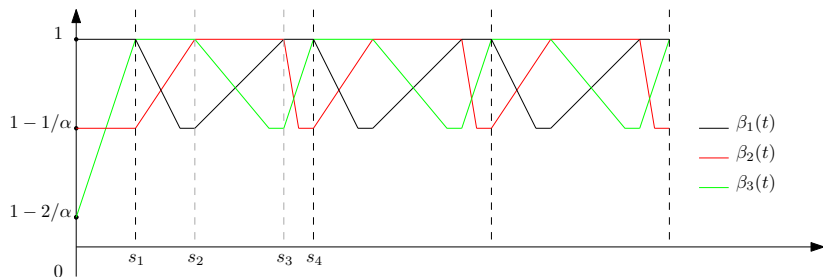
- 1 Large jumps
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Cyclic mutation graph, counter-cyclic resident traits

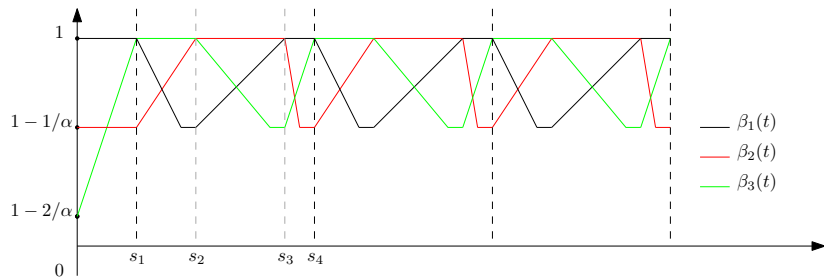


$$\alpha > 2$$

Cyclic mutation graph, counter-cyclic resident traits



Cyclic mutation graph, counter-cyclic resident traits



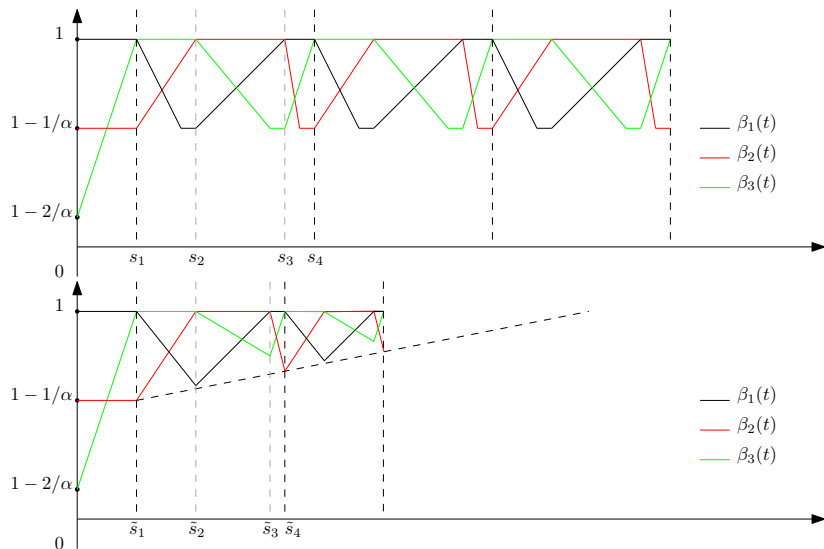
If moreover

$$f_{\bullet\bullet} > -f_{\bullet\bullet}$$

$$f_{\bullet\bullet} > -f_{\bullet\bullet}$$

$$f_{\bullet\bullet} > -f_{\bullet\bullet}$$

Cyclic mutation graph, counter-cyclic resident traits



Observations

If the mutation rate scales like

$$\mu(K) = K^{-1/\alpha}$$

- The sequence of resident traits is not necessarily representative of the structure of the mutation graph.
- The length of the jumps of the adaptive walk is not restricted by $\lfloor \alpha \rfloor$.

Thanks ! ... and some advertisement

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Paul Bastide (Université de Montpellier)	Anna Kraut (Universität Bonn)
Sylvain Billard (Université de Lille)	Estelle Kuhn (INRAE, Jouy-en-Josas)
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